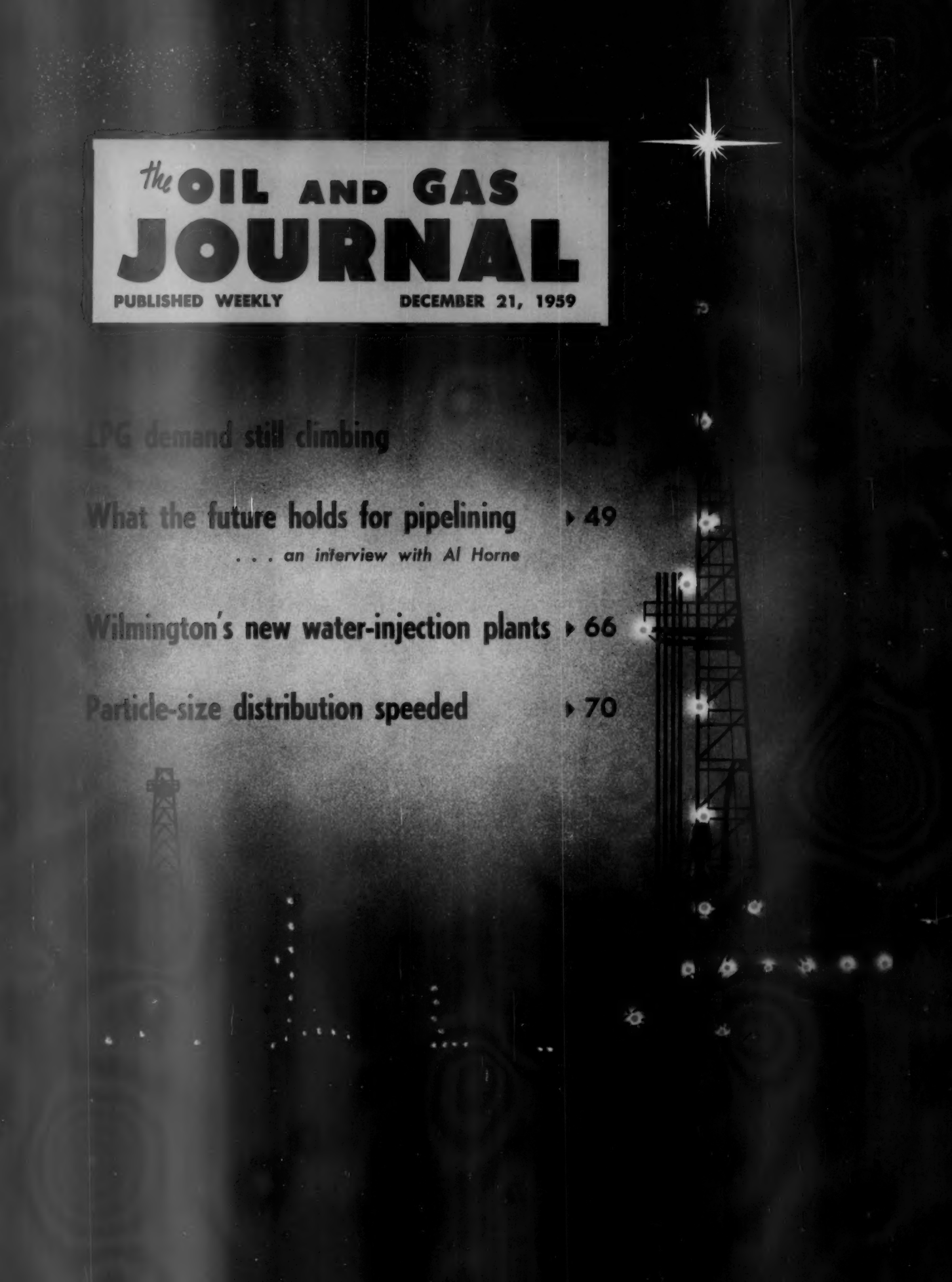
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY DECEMBER 21, 1959



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. . . an interview with Al Horne

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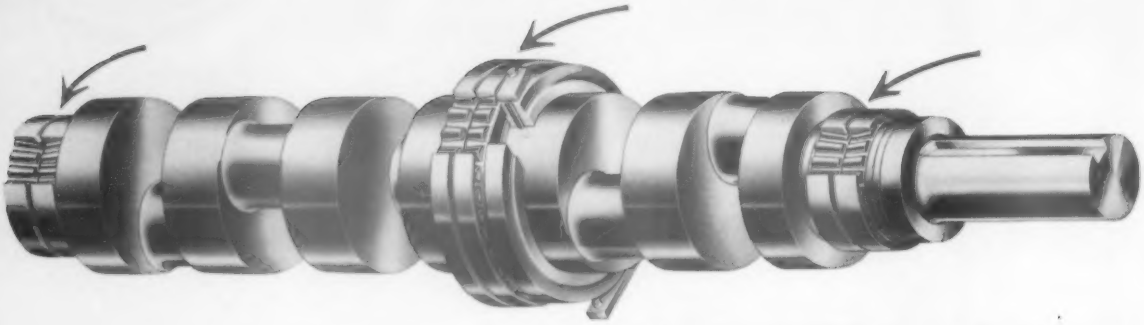
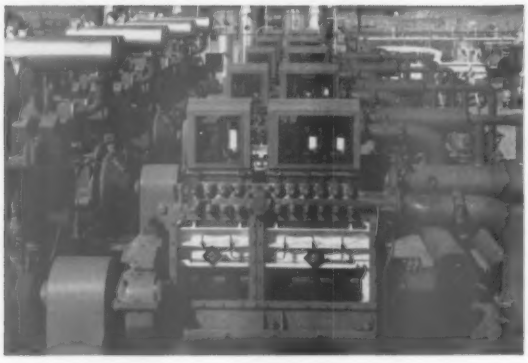
Particle-size distribution speeded ▸ 70



Get smoother, maintenance-free operation...



on first quintuplex pump to use 3 double-row tapered roller bearings ...Timken® bearings, of course

WHEN Ajax Iron Works designed this quintuplex pump, it was an important first in the field. They use three double-row tapered roller bearings on the crankshaft to get smoother operation, eliminate field adjustment. And they're *Timken®* bearings. The double-row Timken bearings are naturals for the steady, heavy-duty work of the most severe oil field and industrial pumping. And like all Timken bearings, they assure longer bearing life and practically maintenance-free operation. Here's how they do it.

1) Timken bearings take *both* radial and thrust loads. Their tapered construction does it. They hold shafts in positive alignment, minimize deflection and end play.

2) Designed and precision-made to have true rolling motion, Timken bearings practically eliminate friction. They *roll* the loads.

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4) Because steel is the heart of a bearing, we use only the finest. We make it ourselves to be sure. No other American bearing maker does.

To get better machines, make sure they're equipped with Timken tapered roller bearings. ***When you buy Timken® bearings you get...*** *1) Quality you can take for granted. 2) Service you can't get anywhere else. 3) The best-known name in bearings. 4) The pace setter in lower bearing costs.* The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

First in bearings for 60 years

BETTER-NESS rolls on

TIMKEN®

tapered roller bearings

OIL AND GAS JOURNAL
Vol. 57 No. 52

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Annual index available on request.

TECHNOLOGY—OPERATION

Production

New Plants Boost Wilmington Water-Injection Capacity 66

D. H. Stormont

New standards for capacity, compactness, and automatic control in high-pressure water injection have been set by two plants recently completed in California's Wilmington field. Both operate unattended. Automatic controls shut down any pumping unit in the event of an electrical or mechanical malfunction. The large plant can supply 287,000 bbl. of water daily and the small one, 157,000 bbl. daily.

Drilling

Mud Displacement in Multitubing-String Wells 78

By W. W. Word

There are limitations in the special equipment used in multistring wells, and techniques of mud displacement must be varied to meet the peculiar requirements of a given installation. Here is how to select the best methods to use in multizone wells.

Pipelining

New Roller Compacts Ditch Backfilling 84

A special sheepsfoot roller is being used to compact backfill at pipeline road crossings, in connection with the interstate highway program in Texas.

Portable Bender Saves Money 85

Pipeline maintenance can now be carried out more easily thanks to a new bending shoe which can be attached to a gang truck for bending pipe. It uses the sideboom principle.

Refining-Processing

New Instrument Determines Catalyst Size Distribution 70

By Kenneth W. Brooks

Size distribution of fluid cat cracking catalysts is being determined quickly on a routine basis at Indiana Standard's Sugar Creek, Mo., refinery. The method is simple, fast, and accurate, and will handle a wide range of particle size and material.

Standardization Cuts Centrifugal Pump Costs 72

By R. G. Jobe

A new vertical centrifugal pump with an integral electric driver meets the performance requirements for 80% of the centrifugal pumps in Shell Chemical's Houston plant. Only one case is required. Installed costs drop 20 to 30% and maintenance costs 15 to 25% when a regular unit is replaced by the new one.

New Activated-Sludge Equipment Upgrades Waste Treatment 75

By A. A. Kalinske

The activated sludge process has been subjected to extensive study with the result that it has been made more economical and efficient and its application greatly broadened. New equipment is now being designed to fit process needs more exactly than has been formerly possible.

New Unit Provides Water for Aminoil Refinery 81

A submerged-combustion unit and an air-cooled steam condenser work together to provide 25,000 gal. of pure water daily at the Middle East installation.

The Foreman's Page 82

Pressure in stationary fluids.

Questions on Technology 83

New American tanker rates.

the OIL AND GAS JOURNAL Newsletter

Dec. 21, 1959
Tulsa, Okla.

Refiners are trading thick and fast on new import quotas:

A pattern seems to be emerging indicating inland refiners will get a better deal than they had in 1959.

Smaller volumes won't get as much bonus, possibly about 60 cents in differential values on volumes of foreign and domestic crudes traded.

Greater quotas—those running 4,000 to 5,000 bbl. daily or higher—may net domestic refiners differentials of as much as $1 to $1.25 per barrel. Many crude-oil men think the trades over all will average out at 90 cents a barrel (p.54).*

Note this proposed change in District 5 import rules:

Oil Imports Administrator Carson suggests importers be permitted to bring in up to 25% of crude quotas in unfinished oil. But each barrel of unfinished oil imported will count as 2 bbl. of crude under the importer's quota.

Interior Department said December 17 it will accept suggestions from the industry for 30 days before acting on the proposal.

Offshore lease sales are back in the news:

...Bureau of Land Management has set February 24 as date for next sale of Continental Shelf leases off coasts of Texas and Louisiana. About 1,608,000 acres will go on block.

..Alaska's first offshore sale netted state $4,021,020 for 77,831 acres or $51.65 per acre (p. 47).

▼ ▼ ▼

Wall Street is too bearish on oil industry outlook.

Many major-company executives report the prospects for healthy earnings are good. They deplore the prevalent advice of some brokers to dump oil securities from investors' portfolios.

The financial community—and much of the oil industry itself—is too prone to swing between extremes of optimism and pessimism regarding oil's outlook.

Example: The bullishness during the Suez crisis was

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*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

entirely unjustified in view of the problems then piling up for the industry worldwide. Today's bearishness is equally unrealistic in view of the industry's prospects for meeting current problems.

▼ ▼ ▼

A major Abo reef strike apparently has been made on the south edge of Maljamar field in Lea County, New Mexico, by Kewanee Oil and Carper Drilling.

Initial tests covering 363 ft. of saturated reef dolomite had oil flows up to 24 bbl. an hour. The Abo reef produces in two other New Mexico fields lying along the northern edge of the Delaware basin. It is credited with exceptional per-acre reserves.

Deeper drilling may be the year's exploration story in the Illinois basin.

Texaco now has basin's deepest producing well at its 16 Silverman in Wayne County good for 216 bbl. daily from Devonian-Dutch Creek sand perforations at 5,319-26 ft. Texaco is deepening another well in the area.

Most Illinois basin production is in the Mississippian.

Another interesting development is occurring in Ohio where wildcatters are hitting with offsets to 50-year-old dry holes (p. 107).

They are able to make good completions by using modern drilling and fracturing techniques.

▼ ▼ ▼

Louisiana plans to call in crude buyers to explain why their nominations always fall far short of actual needs.

The conservation commission is making a detailed study of nominations and allowables for past 2 years. Nominations for January and February totalled 825,000 bbl. daily but the allowable was set at 945,071 bbl. daily.

Depth bracket allowable was increased for first time in 16 months from 34 to 35% of potential production under formula fixed in 1953.

The production increase in Louisiana brought a blast from Texas independents. They feel Texas producers are being forced to absorb the blow of production increases in Louisiana and several nonprorating states.

Caltex is playing a major role in marketing Saharan oil in France.

The French affiliate of California Standard and Texaco is completing deal with a French Government company, SN Repal, to take some of the oil now moving by pipeline from the desert.

Caltex has a 25,000-bbl. refinery near Bordeaux and

a string of service stations in France. Repal has neither. Rest of the oil is controlled by a private French firm, Cie. Francaise des Petroles, in which Government owns a minority interest. C.F.P. has refining and marketing affiliates.

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First completion of oil well on ocean floor should be made by spring.

Plans are in the mill now for such a completion on the floor of the Gulf of Mexico. Only previous experience in this work was off the coast of California. The CUSS group placed the wellheads of their core holes on the ocean floor. But these wells were not completed as producers.

Significance of ocean-bottom wellhead is the elimination of the usual expensive platform.

Drilling contractors are watching with interest move of API Production Division to write a model rotary drilling contract and bid specification form.

API group has a committee working on the job. AAODC has worked on same task for several years.

Contractors say if model contract comes into wide use it will let them know what conditions to expect when they bid on jobs.

First real unitization agreement in Venezuela is now being buttoned up. It's scheduled for submission to Government by January 1.

Unit is Southwest Bachaquero area of Lower Lagunillas in Lake Maracaibo. Participants are Shell, Creole, Mene Grande, and San Jacinto.

Pressure to unitize comes from Venezuelan Government. But operators foresee benefits in lower operating costs plus greater ultimate recovery. Success here may speed Venezuelan objective of widespread unit operation where there are several concessions in one reservoir.

▼ ▼ ▼

Biggest problem of refiners—currently and for the future—is No. 2 fuel oil.

Market for the distillate is not growing as fast as for gasoline, due largely to competition from natural gas.

Many refiner-marketers say they could sell more gasoline if they could peddle the distillate they would have to make. Their operations thus are geared to their No. 2 sales.

Shifting yields to solve the problem isn't as easy as it sounds. This usually raises gasoline costs and reduces crude throughput. Refiners feel the industry's greatest need is a new process to turn distillate cuts into gasoline cheaply.

In this connection, two new processes, Isocracking and

Unicracking, have amazed both California Research and Union Oil with the amount of interest they've caused.

Both are designed to convert heavy naphtha and middle distillates to high-octane gasoline. They were tailored to needs in California. The response from coast to coast indicates all refiners are worried by the imbalance in yields.

Oil companies who are not using isotopes should take another look at them.

Prices are tumbling on the principal isotopes used in countless industry applications. SEC reports in fiscal 1958 its sales of the eleven most used isotopes totalled nearly 152,000 curies at average price of $13.46 per curie. But by fiscal 1959 sales topped 253,000 curies at average of $5.70.

▼ ▼ ▼

Where the customer's gasoline money goes has been analyzed by Shell like this:

Refiner—10.89 cents per gallon, or 50%.
Transportation and terminalling—1.75 cents, or 9%.
Wholesaler (jobber)—3.75 cents, or 17%.
Retailer—4.98 cents, or 24%.
Total price to customer before taxes—21.37 cents.
Average federal and state taxes—10.12 cents.
Grand total to customer—31.49 cents.

▼ ▼ ▼

Meaning of Supreme Court ruling in Transco gas-purchase contract apparently is this:

FPC itself must decide whether initial prices and their impact have been considered fully in compliance with formula set down in the CATC decision.

It does not necessarily mean a full-blown hearing—although it could—and producers believe there is no mandate to reduce prices. They believe that the high court merely asked FPC to decide whether its original decision would have been the same if it had the benefit at the time of the later CATC ruling (p. 47).

Outlook for new pipelines:

Products-line building in Canada is expected to spurt in the next few years. One line now under discussion would serve airports. Canada now has only three refined-products pipelines.

Another crude line is being studied in Argentina. The builder will be one of the U. S. operators there.

A new tank seal is under development by one pipeliner. It might solve an old problem: How to keep water from contaminating crude and products in floating-roof tanks. Initial tests indicate much greater effectiveness than present seals.

New, Easy-to-Use Guide to Selection of Oil Field Lines

Here's a new bulletin that will help you select the wire line you need for any oil field operation. Ask for No. 5956.

Whyte Strand Rotary Lines are given special processing in Macwhyte's wire and rope mills. An extra coating of lubricant with special additives is applied to each wire to withstand the extreme pressures in steady rotary drilling. This Macwhyte design advantage assures you low cost per ton-mile drilling.

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180

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Seattle, St. Paul, Chicago, Detroit, Pittsburgh, Newark

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They are new only in the production sense. Actually this announcement was preceded by long development and research which drew on more than 90 years of experience in instrument and valve making.

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Despite their small size, "Master-mite" Solenoid Valves are more rugged because the "beef" is where it counts—in the valve body. The generous, moisture-resistant coils do not overheat. Entire assembly is leak-tight at pressures up to 540 psi. Operation is positive . . . yet quiet. Valves can be cleaned without breaking connections . . . can be used in any position.

Bodies are available in either brass bar stock or 18-8 stainless steel. All parts in contact with media are stainless steel. Down to the last detail, "Master-mite" solenoid valves are designed and built to stand up and work right under the toughest conditions including vibration. They are Underwriters' approved for use on oxygen and hydrogen and as safety valves.

Read the accompanying specifications. Note the wide range of selection. Ask for bulletin containing all details.

Note these specifications

- ★ **Types:** Direct acting conduit type and grommet type. Four patterns of each size and type: globe, bottom outlet, angle left, and angle right.
- ★ **Sizes:** ¼" and ⅛" NPT.
- ★ **Pressures:** From vacuum to 540 psi. maximum.
- ★ **Orifice sizes:** Ten sizes: 3/64", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 1/4".
- ★ **Voltages:** Standard with 115 volts 50/60 cycle AC coils, but also available in 12, 24, 208, 230 and 460V, 50/60 cycle coils.
- ★ **Leads:** Standard with 18", but other lengths available; also full range of connectors.
- ★ **Body:** Brass bar stock or 18-8 stainless steel.
- ★ **Moving parts:** All stainless steel.
- ★ **Seat disc:** Synthetic rubber.
- ★ **Approved by Underwriters' Laboratories as a safety valve.**

New bulletin tells the whole story

Shows all types, patterns, sizes, coils, options, etc., and contains highly useful flow curves.

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Yet even the G.T.M. didn't figure on the kind of punishment in store for this hose. For the operator decided to try the relatively new air-drilling technique—even though hot air, blasted through at high velocity, inevitably means shorter hose-life.

The result? At last report, the G.T.M.'s hose had drilled 34 wells—213,000 feet of hole. And a good deal of that was tough air-drilling.

But that's typical of the outstanding performance you can expect from all Goodyear hose—engineered for every phase of the oil industry. For the full story on any type, contact your G.T.M. through your Goodyear Distributor—or by writing Goodyear, Industrial Products Division, Akron 16, Ohio. . . .

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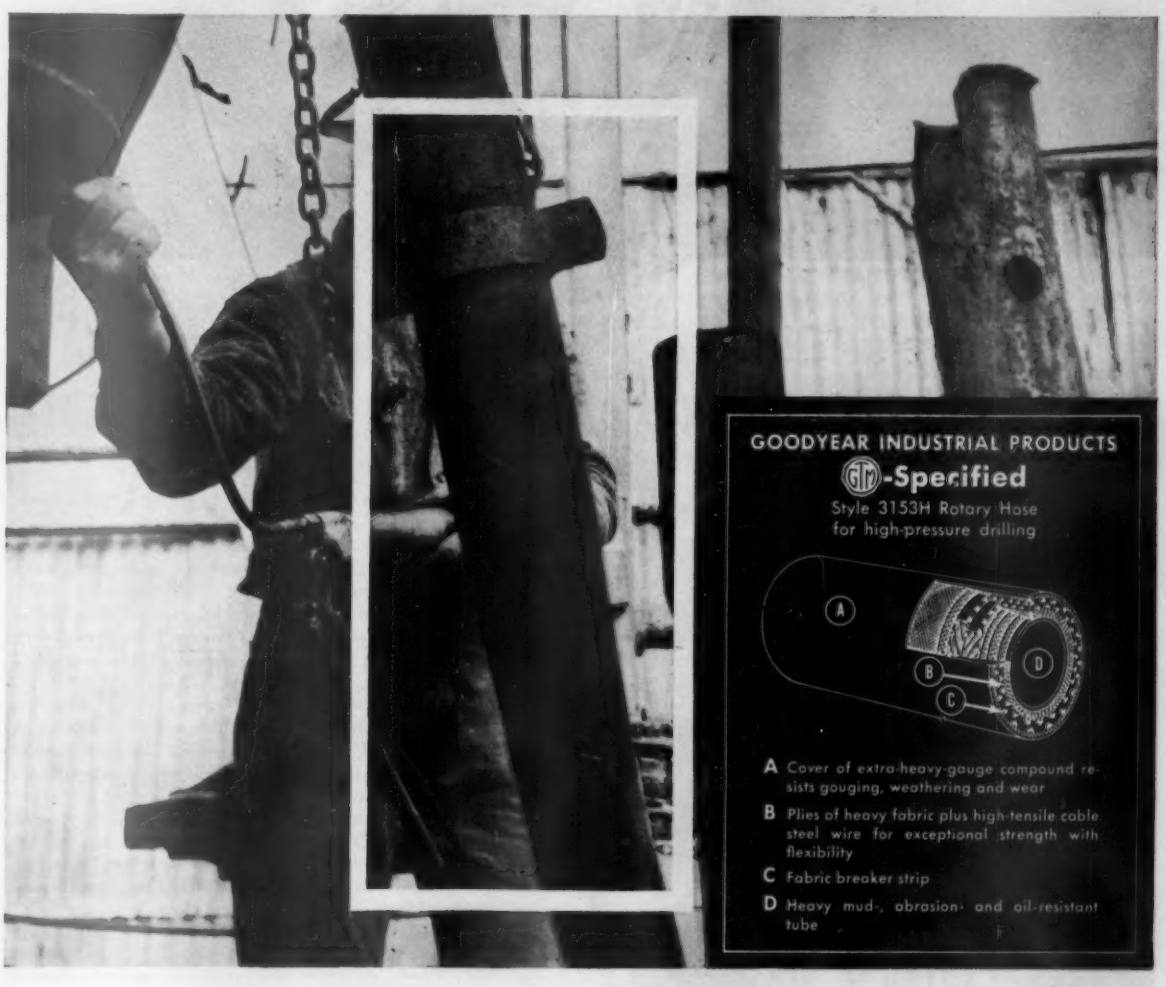
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ROTARY DRILLING HOSE BY

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Operators who swear by the outstanding performance of "Oilwell's" DI-HARD Liners may not be interested in this particular feature. But if you want liners that can be reconditioned, we know you'll go for HI-HARD's because they're equally outstanding in the re-workable class.

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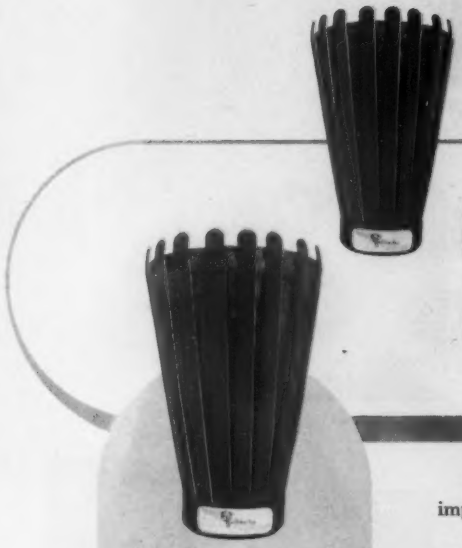
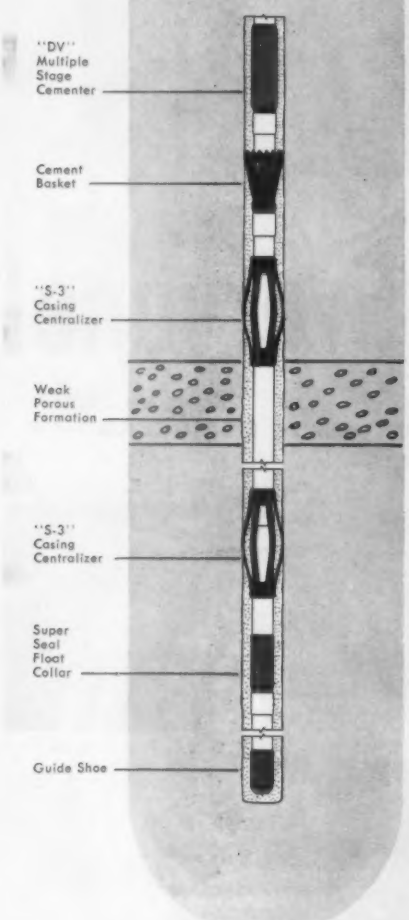


HALLIBURTON CEMENT BASKETS



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FOR CEMENT BASKET
AND OTHER HALLIBURTON CASING PRODUCTS

Rugged, easy to use and economical... that makes this cementing tool important for porous or weak formations.

The Halliburton Cement Basket is especially designed to provide a dependable annular bridge that will reduce fluid loss or break down of weak formations, and help support the cement slurry column until its initial set.

The Halliburton Cement Basket is expertly constructed of high strength flexible steel staves, mounted on a steel ring that slips over casing and an insert liner of heavy duty water-proof canvas that is riveted to the staves and ring. The insert liner is resistant to oil, weak acids and mud chemicals.

The steel staves permit fluids to by-pass upward while running casing, circulating or cementing. After the casing becomes stationary, or circulation is stopped, the basket expands to the bore wall like an inverted umbrella. Any downward movment of fluids or solids against the basket firmly presses the staves and insert liner close to the wall to form an effective annular bridge.

Halliburton Basket Casing sizes are available from 4½" to 10¾", covering minimum through maximum hole sizes from 6¾" through 16¼" inclusively.

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★ on a liner string below a Halliburton Type "H" Solid Baffle Collar to hold cement pumped through the ports in the collar into basket to partially protect the producing zone or any lower formation from contamination.

★ on casing for a straight casing cementing job to help support the column of cement and give extra protection to any weak or porous area.

★ with EZ Lok Limit Clamps or Solid Set Screw Limit Rings for selective spacing of Baskets between casing collars *without welding*. Split Dent Limit Rings furnished with each Basket may be spot welded, if desired, on pipe above and below each Basket to permit movement of casing with Basket open.

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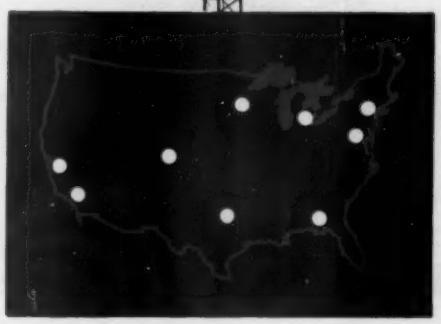

This chorus usually sings the praises of Collins Microwave and Carrier Equipment. They are the 13 sales engineers who represent Collins' Texas Division to utilities, railroads, telephone and pipeline companies. During this holiday season, they extend Christmas greetings from the 1,750 employees of Collins' Texas Division to Collins' friends everywhere.

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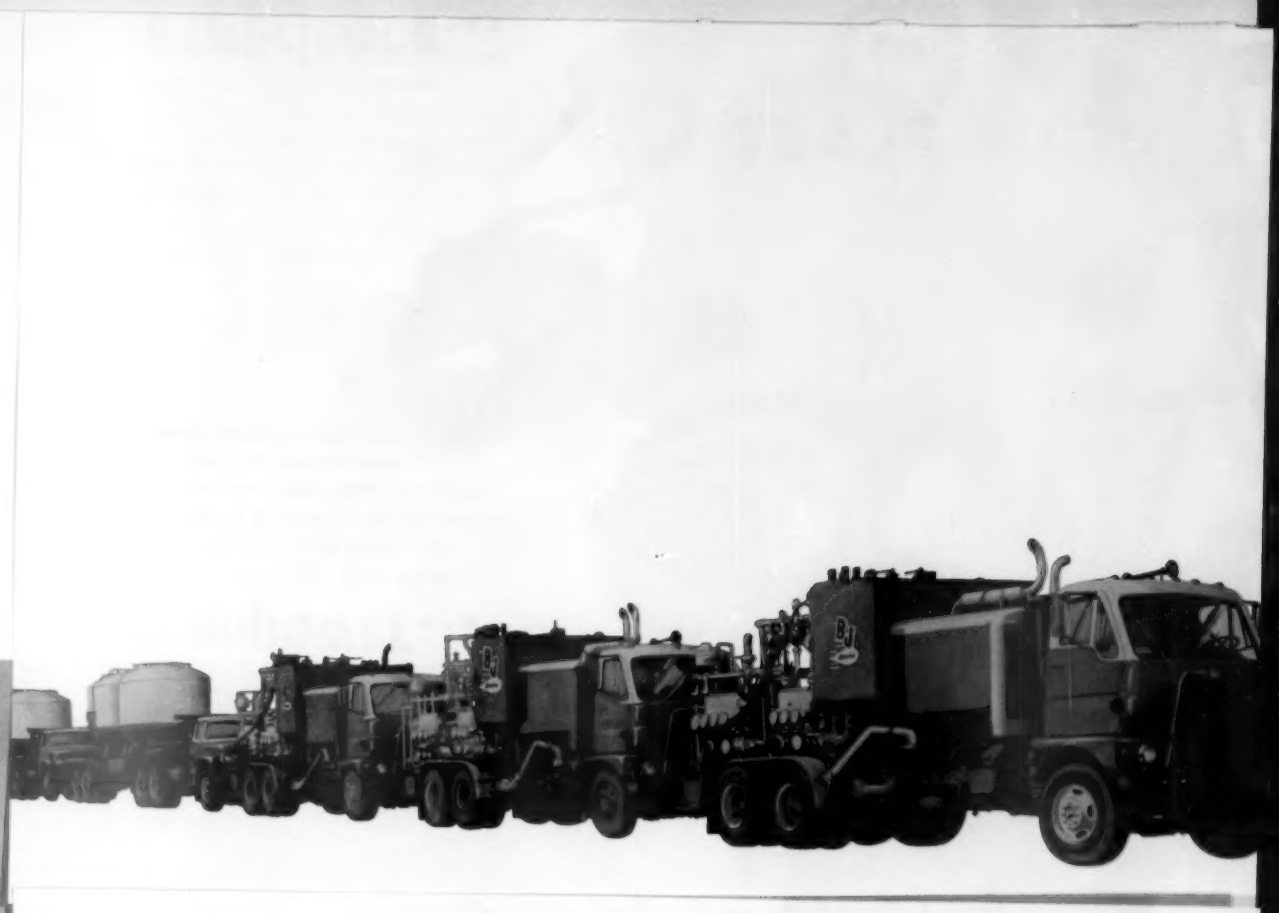
EXPORT: British Anchor Chemical Corp., New York

BW® Marbon



this is what it takes to cement an oil well...

It takes
manpower...

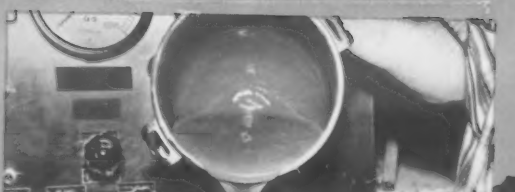
Our men are highly trained both in theory and in tested techniques. The men of BJ Service are field proven veterans who know local conditions and have the answers when special problems arise.

experience...

Our experience and knowledge cover more than 30 years of oil well cementing. When you call on BJ Service, you can be sure that every step of your job—from slurry selection to clearance for drill-out—is in the hands of capable, thoroughly experienced cementers.

engineering...

Advanced engineering has earned BJ Service its reputation as the "Pacemaker" of the service industry.



reputation as the "Pacemaker" of the service industry. Two engineering and development laboratories devote full time to researching, developing and testing new materials, tools and techniques for use by BJ Service stations and crews. The great Borg-Warner Research Center also assists with these laboratory programs.

equipment and manufacturing...

Our equipment is job-engineered and manufactured by BJ Service to handle any cementing assignment —from the most routine surface casing job through the most complex squeeze cementing procedure. In power, safety, dependability and roadability, these BJ Service units are the best in the oil patch.

field facilities...

BJ Service has a network of more than 70 offices and field stations throughout the United States and Canada. See back page for complete listing of Field Stations offering cementing services.

BJ Service has what it takes to cement an oil well

ON YOUR NEXT JOB CALL BJ SERVICE . . . THE COMPANY THAT PUT QUALITY COMPETITION INTO THE CEMENTING BUSINESS.

STATE	TOWN	PHONE
California	Avenal	429
	Bakersfield	FAirview 3-7548
	Long Beach	GArfield 2-1249
	Ventura	MIller 3-6196
Colorado	Cortez	LOgan 5-3767
Louisiana	Bossier City	2-3665
	Lafayette	CEnter 5-5324
	Lake Charles	HEmlock 6-7218
	New Iberia	EMerson 4-4543
Montana	Glendive	EMpire 5-4435
Nebraska	Kimball	BEverly 5-3141
New Mexico	Farmington	DAvis 5-6961
	Hobbs	EXpress 3-5194
North Dakota	Tioga	4-2517
	Watford City	3051
	Williston	GReenfield 3-5421
Oklahoma	Enid	ADams 4-7067
	Woodward	ALpine 4-3381
Texas	Abilene	ORchard 2-9764
	Andrews	LAmbert 3-2780
	Big Lake-Rankin	309
	Big Spring	AMhurst 3-2601
	Breckenridge	HIckman 9-4662
	Crane	3654
	Eldorado	2-6111
	Graham	LIncoln 9-1110

STATE	TOWN	PHONE
Texas (cont.)	Kermit	JU 6-3940
	Levelland	TWilight 4-3155
	Luling	TRiangle 5-2458
	Midland	MUtual 2-9456
	Monahans	WIlson 3-2554
	Odessa	FEderal 2-1417
	Pampa	MOhawk 5-4461
	Pearsall	FEderal 4-3605
	Pecos	HIckory 5-3449
	Post	
	San Angelo	7710
	Snyder	HIllcrest 3-5113
	Sweetwater	BElmont 4-4864
Wyoming	Casper	2-2591
	Gillette	MUtual 2-3484
	Riverton	ULster 6-9471
	Worland	FIreside 7-3237
Canada		
Alberta	Alliance	62
	Calgary	AM 3-1148
	Drayton Valley	263-R-2
	Drumheller	VA 3-2359
	Edmonton	GE 3-1498
	Fox Creek	
	Medicine Hat	JA 6-4035
	Olds	
	Red Deer	4212
	Swan Hills	
Bolivia	Yacuiba	

OIL WELL SERVICES

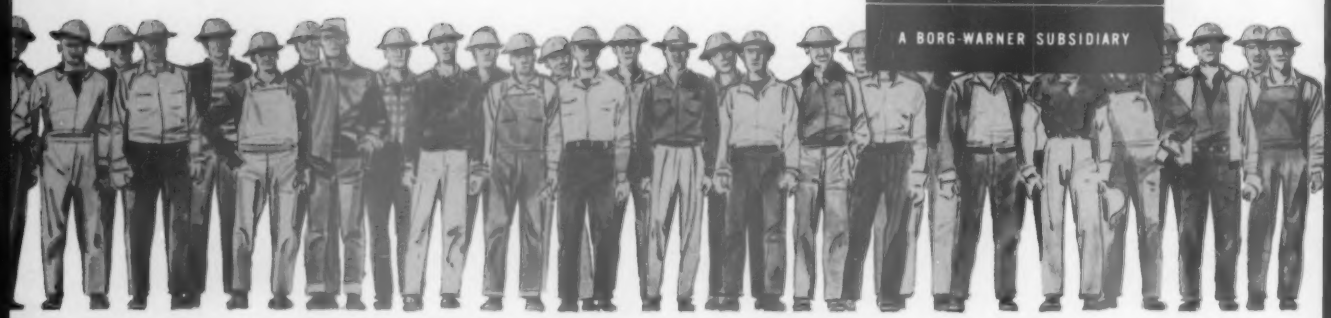
BJ Service, Inc.

A BORG-WARNER SUBSIDIARY

LONG BEACH, CALIFORNIA

BJ Service

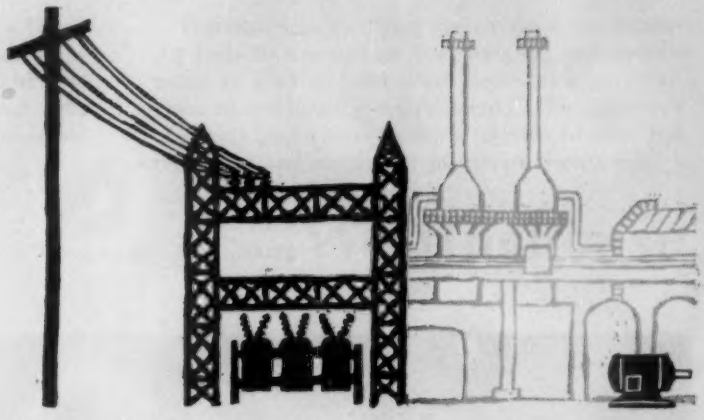
A BORG-WARNER SUBSIDIARY



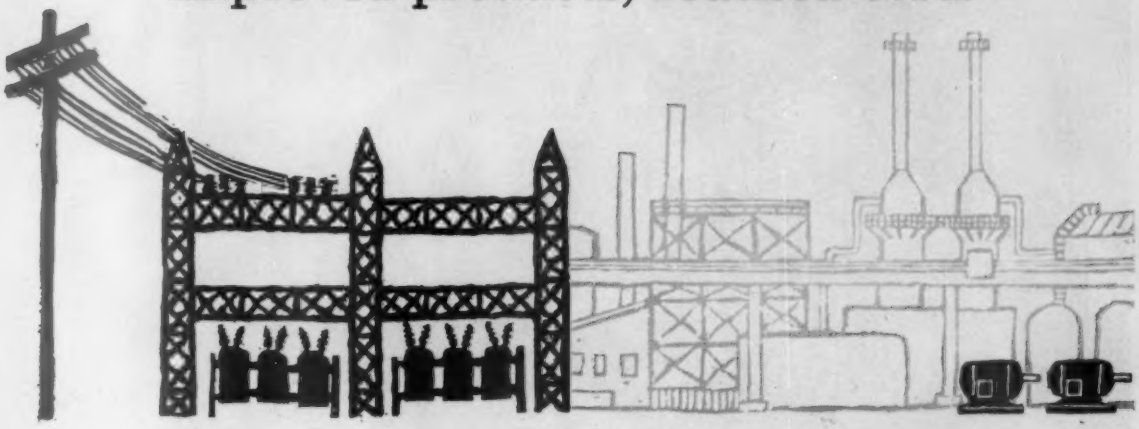
ITHO IN U.S.A.

plan now to

POWER-UP FOR PROFIT ELECTRICALLY



Sinclair Refining did: increased production, improved products, reduced costs

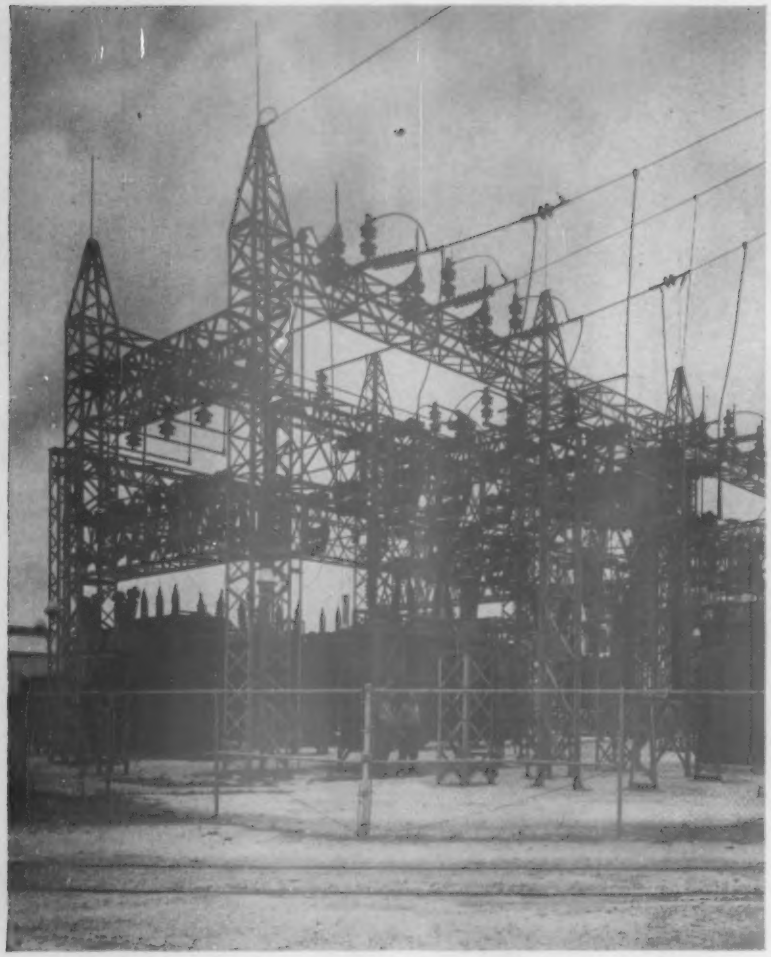


When Sinclair Refining modernized and expanded their Houston refinery, production increased and product quality improved. All this was accomplished through a carefully planned Power-Up program. The reliability of present-day electrical equipment and power supply minimized the amount of stand-by equipment needed.

You will need more capacity to meet the 40% increase in demand for goods by 1965. Be sure that your electrical equipment is engineered to produce earnings as well as output. See how Westinghouse helped Sinclair Refining to Power-Up.

YOU CAN BE SURE...IF IT'S **Westinghouse**

here's how Sinclair Refining



Main substation with two incoming 66-kv power lines is equipped with Westinghouse switchgear and transformers. Continuity of service is assured through the use of this dual feed to the refinery.

Relaying panels for protection of two incoming 66-kv lines, showing pilot wire and associated relays. These high-speed relays provide superior circuit protection by minimizing equipment damage and provide service continuity.

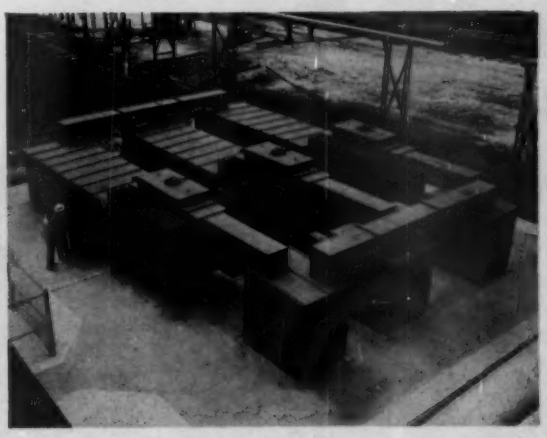
POWERED-UP with Westinghouse

Expansion and modernization at Sinclair's Houston refinery were carried out in two phases. Initially, a fluid catalytic cracking unit was added to expand the plant's capacity. Subsequently, two HDS (Hydrodesulphurization) units were added to improve the product quality.

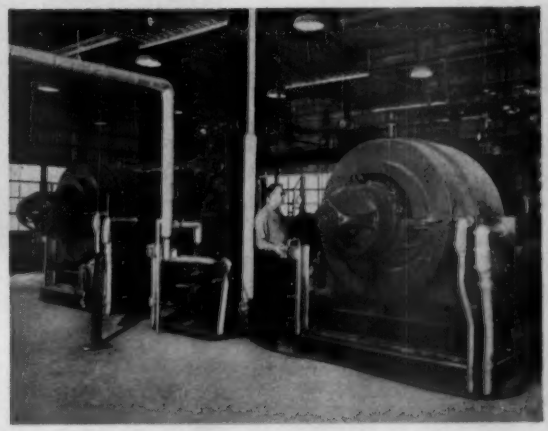
The complete electrical system from the incoming lines to the motors was designed and coordinated to give an integrated electrical supply tailored to the specific requirements. This approach provided the most economical system to meet the reliability and continuity of service demanded.

YOU CAN BE SURE...IF IT'S **Westinghouse**

The refinery is served by three power transformers through three outdoor high-voltage switchgear assemblies interconnected by tie bus. Protective relaying system permits fast change-over, insures service even with power interruptions.



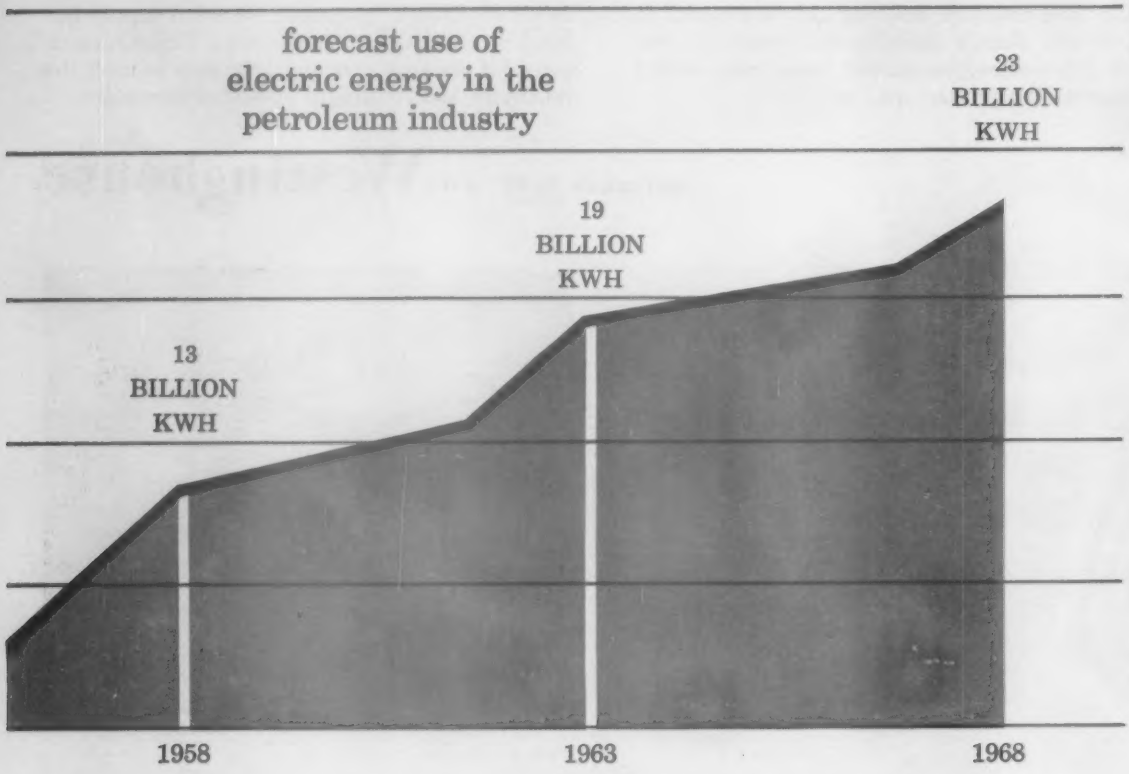
Unit substation with three 5000-kva transformers. Availability of alternate transformers and breakers provides the ultimate in reliability.



Large Westinghouse synchronous motors with Thermalastic® insulation which assures trouble-free operation and longer life. They are driving cooling water circulation pumps.

here's why you should plan now to

POWER-UP FOR PROFIT ELECTRICALLY



To stay competitive, you will be investing in a tremendous increase in electric power equipment. Be sure it is engineered to produce profits.

Greater use of electrical energy and up-to-date electrical equipment can help you get a better return on your investment through improved operations. In your plant it may be higher capacity machinery, more efficient equipment, or specially engineered controls.

Whatever the need, maximum use of low-cost kilowatthours can help you earn satisfactory profits. Your plant will need more capacity to meet the forecast 40% increase in the demand for goods by 1965.

Be sure—like Sinclair Refining—that your electrical equipment is engineered to produce earnings as well as output. Call your Westinghouse representative or your electric utility power sales engineer. They can tell you the electrical steps you can take *now* to start a Power-Up program in your plant. J-96131

YOU CAN BE SURE... IF IT'S **Westinghouse**

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i. Insulation Blowing
j. Jetting
k. Kerosene
l. LEAF COLLECTOR
m. Molasses
n. Nozzles
o. Oil
p. PILE DRIVER
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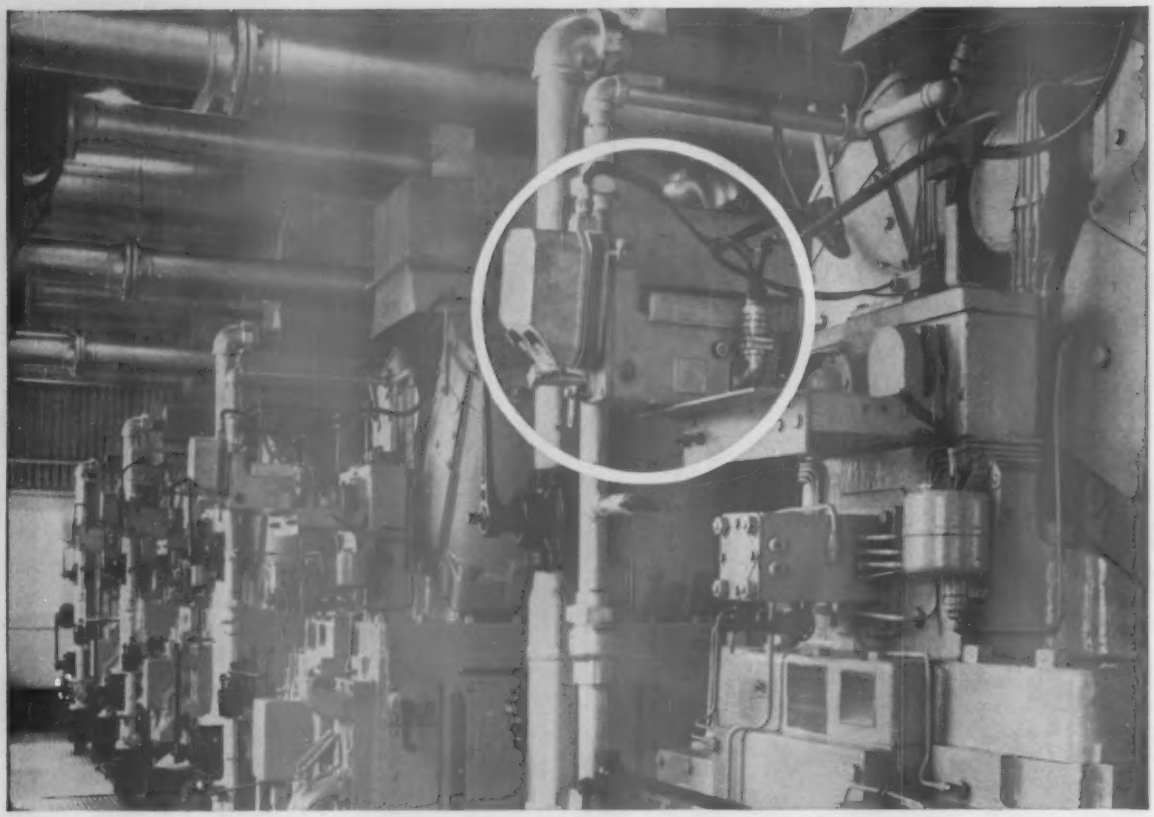


BENDIX DLC IGNITION

designed specifically for natural gas and petroleum industries

A MATCHED IGNITION SYSTEM

1. Long service life
2. Simplified maintenance
3. Longer spark plug life
4. No unscheduled ignition shutdowns
5. Positive spark timing
6. High voltage output
7. Matched ignition system
8. Single or dual ignition
9. Flameproof
10. Low maintenance costs
11. For engines of 6 through 16 cylinders

At the installation shown here, DLC Ignition unfalteringly performs its function in aiding with the preparation of natural gas for consumer use.

Bendix* DLC Ignition is the result of the most modern engineering design, and incorporates the latest developments in ignition materials. That's why it meets the most exacting requirements of modern high-compression engines used by the natural gas and petroleum industries.

Because DLC Magneto and Hi-V Transformer Coils form a matched ignition system, it delivers ample voltage while, at the same time, assuring reduced maintenance costs.

If you want facts on why important operators specify Bendix DLC Ignition, write: SCINTILLA DIVISION, BENDIX AVIATION CORPORATION, SIDNEY, NEW YORK. *REG. U.S. PAT. OFF.

Export Sales and Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y. *Canadian Affiliate:* Aviation Electric Ltd., 200 Laurentien Blvd., Montreal 9, Quebec. *Factory Branch Offices:* Burbank, Calif.; Orlando, Florida; Chicago, Ill.; Teaneck, New Jersey; Dallas, Texas; Seattle, Washington; Washington, D. C.

Scintilla Division
SIDNEY, N. Y.

Bendix
AVIATION CORPORATION

Flow area thru UNIBOLT ADJUSTABLE WING VALVE
Passes Large Quantities of Fluid or Gas
FLOW OF WATER THROUGH UNIBOLT CHOKE WITH 1" SEAT
FLOW OF GAS THROUGH UNIBOLT CHOKE WITH ½" SEAT AT 2000 PSI INLET PRESSURE

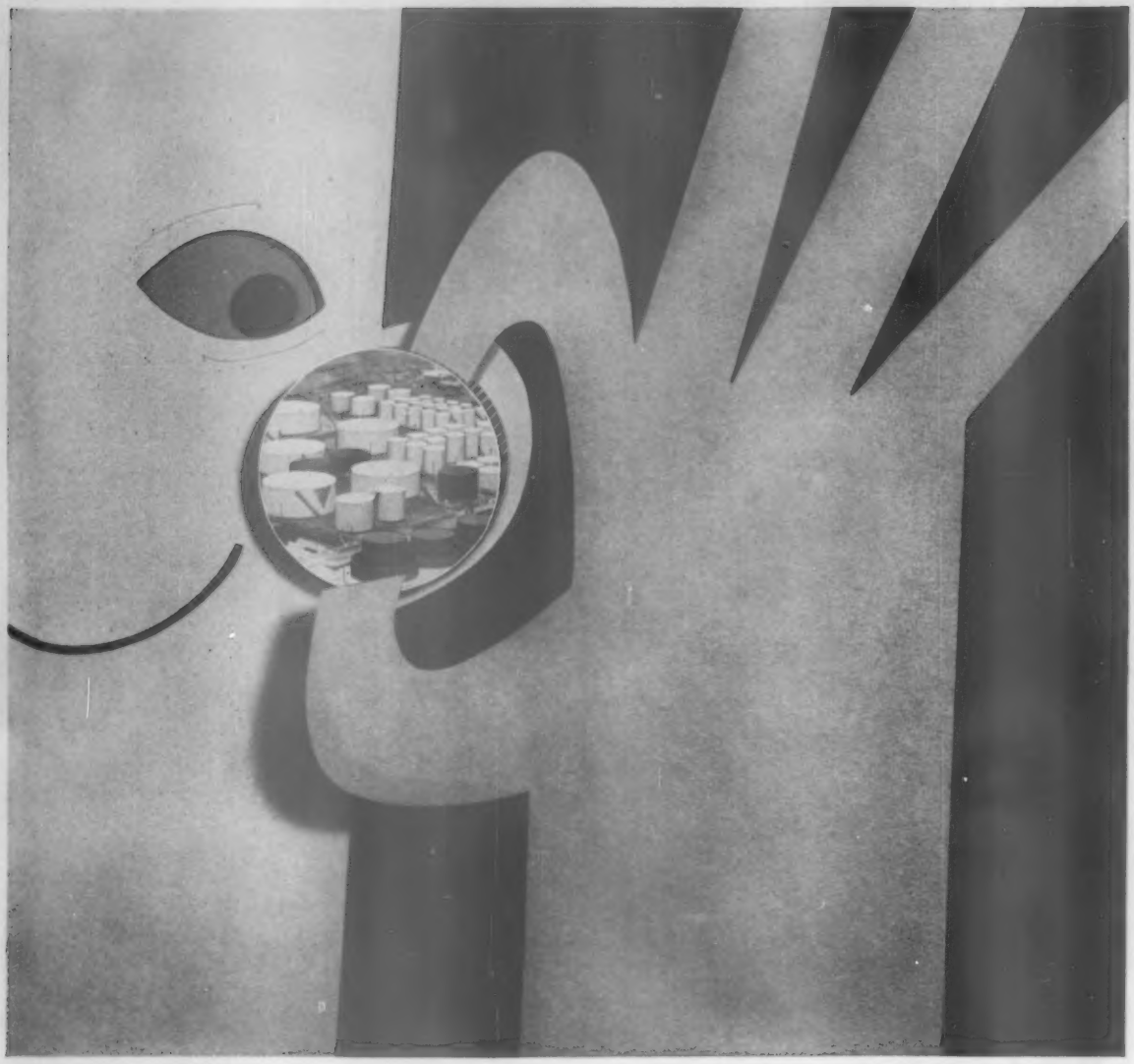
if you could produce 10,000 bbls. per well per day . . .

. . . as the charts show, this UNIBOLT Adjustable Wing Valve would handle the fluid with only a 100-lb. pressure drop! Or, you could produce 28 million cubic feet of gas through it with only a 200-lb. pressure drop. So, while the UNIBOLT Adjustable Wing Valve is not a full-opening type, its one-inch flow area is far more than adequate for practically any desired production rate—*and the cost is importantly lower than for conventional gate and plug valves.*

Actually, there's a dozen more good reasons why this UNIBOLT Adjustable Wing Valve is a solid favorite among value-conscious operators:

1. There are no exposed threads . . . no accidental damage.
2. All metal seats . . . not affected by high or low temperature.
3. Stem packing that needs no tightening.
4. Stem turns freely under high pressures.
5. Threads on stem not exposed to external or internal damage.
6. Full 2½" pilot for true stem alignment and rigidity.
7. Streamlined flow—no obstruction, no turbulence or impingement of flow, no negative pressure areas.
8. Requires no grease to effect a seal . . . may also be used as micrometer-gauged flow bean.
9. Variable choke speeds up initial clean-up or running initial flow tests . . . saves rig time.
10. Can be converted to "Pressurematic Safety Valve" by simply changing bonnet assemblies.
11. Valve can be completely overhauled without removal from tree.
12. Stem seat sealed by metal gasket; power threads assure alignment.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS



"Bank" your liquids where the business is!

Only General American offers you complete tank storage facilities within 500 miles of *almost all* top American markets! Today six General American Terminals* provide nearly 16,000,000 barrels of storage capacity for all bulk liquids that can flow through pipelines.

Only General American Tank Storage Terminals give you all these benefits:

- Complete privacy of storage.
- Maintain inventories to meet production needs and market conditions.
- Lease *what* you need *when* you need it.
- Avoid the capital expenditures of a tank storage terminal and its operation.
- Move your product in or out by tanker, barge, tank car, truck or pipeline.
- General American's warehouse receipts are accepted as the highest type of collateral.

For further information, call or write our nearest district office or terminal.

***Carteret, N. J. (Port of New York), Chicago Ill., Corpus Christi, Texas (Port of Corpus Christi), Pasadena, Texas (Port of Houston), Galena Park, Texas (Port of Houston), Good Hope, La. (Port of New Orleans).**

GENERAL AMERICAN TANK STORAGE TERMINALS

GENERAL AMERICAN TRANSPORTATION *a division of* **CORPORATION**

135 South LaSalle Street *Chicago 3, Illinois*

This aerial view of National Supply's used equipment yard at Odessa, Texas, indicates the diversity of drilling machinery, production equipment and tubular products available through National Stores.

A yard full of bargains from NATIONAL SUPPLY!

Just as a new car dealer has bargains to offer in used cars, National Supply has exceptional values in used drilling, production equipment, and tubular products. This used equipment is generally available through National Supply Stores. The stocks—our own and other manufacturers' brands—represent a wide range of machinery and materials with many *un*used hours of service left.

Of course, no used equipment is expected to be as serviceable as new National Supply products—but the material is in good condition and the prices are very attractive. This is a good deal you should investigate for your equipment needs, and when you do, remember that National is a reliable source and will serve you promptly. Your local National representative will be glad to furnish more details.

3-way record proves superiority of NATIONAL Type B Wellhead Equipment!

Here's the latest big performance record on National Type B Wellhead Equipment—

1. Was selected to suspend the *longest* string of casing ever run in a well
2. It is used with the *heaviest* pipe load ever suspended
3. **It has never contributed to a casing failure**

This 3-way record proves the value of advanced design and engineering which gives National Wellhead Equipment the highest safety factor for every application. Two outstanding examples of this advanced design are:

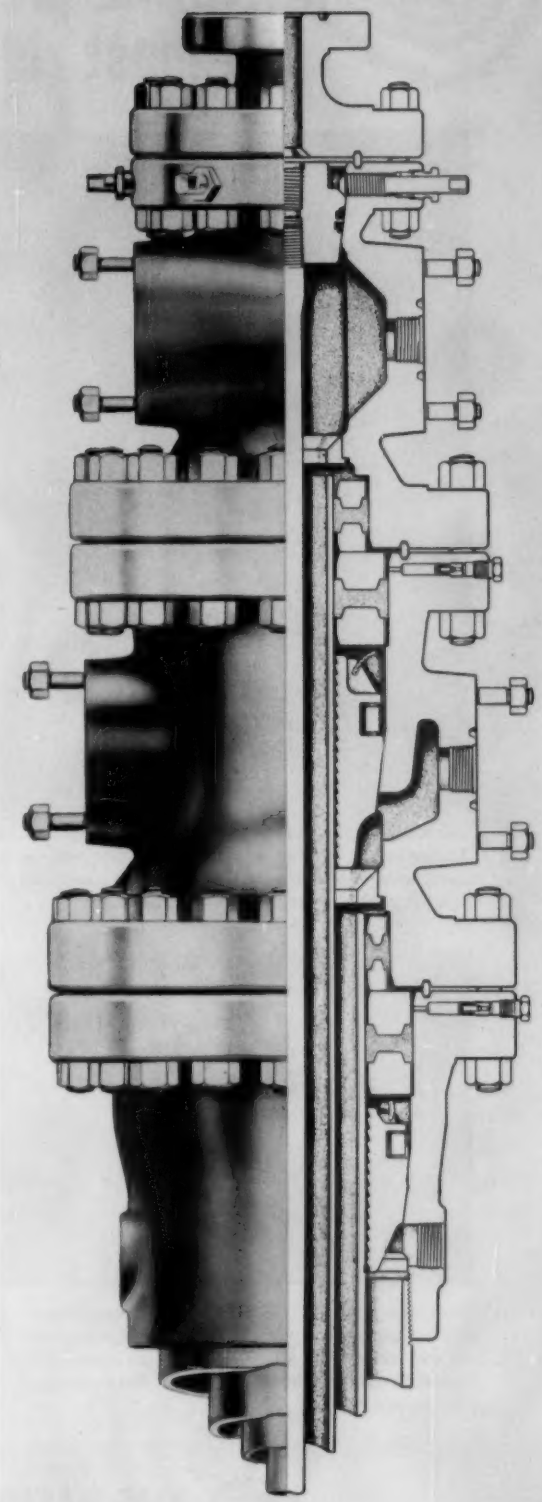
Casing flanges—The counterbore of the National casing flange is grooved for seating of lower regular packing support in order to *separate pressure load from slip load.* Flanges are designed to accept all standard blow-out preventers.

Hinged slips—Self-locating, three-segment assemblies with simple latch bolt, permitting unit to be closed around casing and lowered into place through preventers. These are case hardened—not flame hardened—for added durability. Slips are long and have wicker design which prevents crushing of suspended string.

All National Wellhead bodies and components are rigorously tested at levels above those recommended by API—another assurance of dependability and safety in service. But pre-tested safety and long service life are just two benefits you get with National Wellhead Equipment. Ask the National representative in your area to tell you about the other advantages you gain—including the advisory services of National's staff of wellhead equipment specialists.

National Type B Wellhead Equipment is manufactured in a complete range of sizes, using field-proved bodies and hangers for any type completion. The wide range of accessory and companion equipment provides the operator with dependable wellhead equipment to meet his needs in any oilfield.

More on the next page



This diagram of Type B Wellhead Equipment illustrates the pressure-packed principle employed to separate pressure loads from slip loads.

NATIONAL production equipment... the most reliable you can buy

Get dependable service from precision-made National Sucker Rods. They have top resistance to fatigue, shock, corrosion and impulse loads. Available in a range of grades to meet every well condition.

National Plunger Lift can be the best production method for certain types of wells. It uses formation gas or injected gas for operation, has low initial and service costs. Equipment is also available for gas well operation to remove liquids and maintain a uniform and increased flow rate of gas.

This National J-125 Triplex Pump is the smoothest running pump of its type ever produced. Built for pressures to 6,000 psi and volumes to 11,000 b/d, it has many features designed to assure smooth operation, low maintenance and long service.

Pumpers are available in 13 basic sizes, with more than 148 standard specifications in beam and crank counterweighted types. There's one to suit any specific pumping need that you may have!

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

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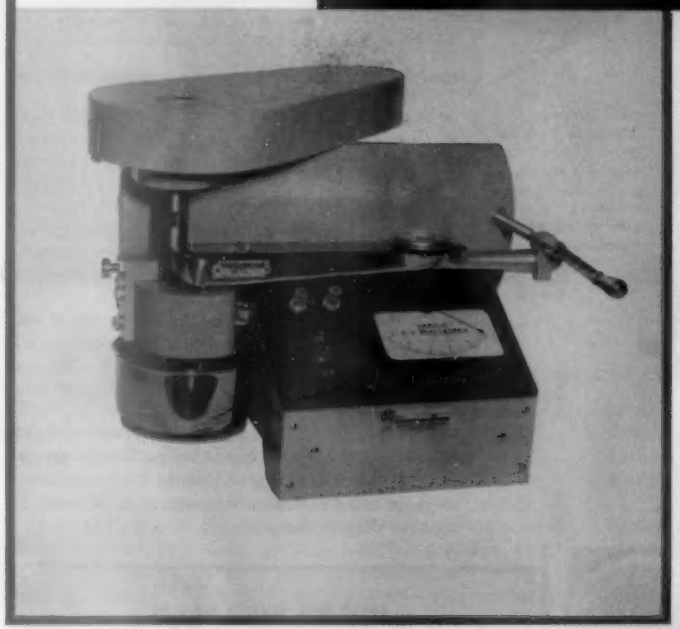
BAROID RESISTIVITY METER

A transistorized electrical meter for measuring the resistivity of fluids, slurries, muds and filter cakes. Small, lightweight, rugged — built for field use. Single direct scale is easy to read. Conductivity is determined by taking the reciprocal of the resistivity measurement. In leather field case. $165.00

NEW BAROID MUD TESTING INSTRUMENTS *to help you make sure*



BAROID EP MUD TESTER*

Measures extreme pressure lubricating properties of drilling muds. Test results are used to determine amount of mud lubricant additive (Baroid's E P MUDLUBE) needed for makeup or maintenance. Portable for easy field use. $395.00

* PAT. PENDING

ORDER FROM
EQUIPMENT DEPARTMENT

BAROID

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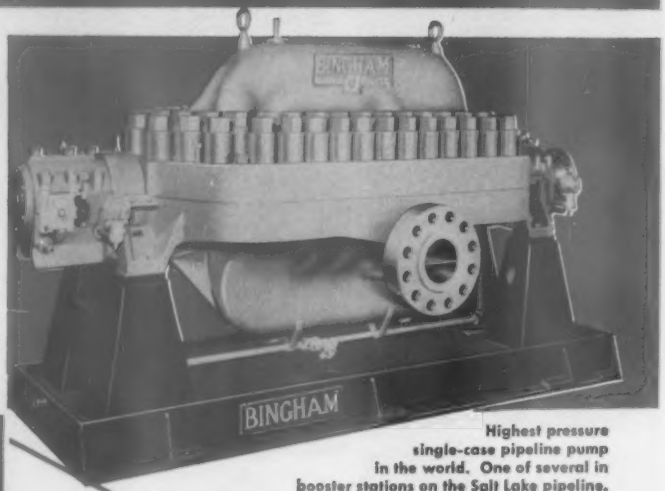
BAROID DIVISION
NATIONAL LEAD CO.
Main Office: P.O. Box 1675, Houston 1, Texas

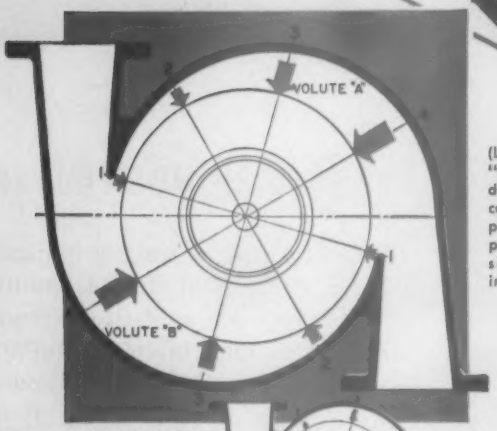
Bingham "DOUBLE VOLUTE" PUMPS

OFFER MOST FAVORABLE OPERATING CONDITIONS FOR MECHANICAL SEALS

...A PROMINENT MANUFACTURER OF MECHANICAL SEALS REPORTS:



Highest pressure single-case pipeline pump in the world. One of several in booster stations on the Salt Lake pipeline.



(Left) Diagram of a **"Double Volute"** double discharge case of a multistage pump showing equal pressures on opposite sides of the impeller.

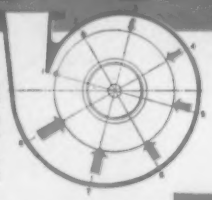


Diagram of **"Single Volute"** pump case (right) showing unequal pressure at opposite points around the periphery of the impeller. These unequal pressures cause "SIDE-PUSH" on the rotating elements, causing wear of rotating parts and excessive seal maintenance.

"In our opinion one of the contributing factors to the success of our Seals in your Pipe Line type of pumping equipment is your 'Double Volute' design, which insures the rotating element being radially balanced hydraulically throughout the entire operating range of the pump. This feature eliminates shaft deflection which permits our seals to establish and maintain uniform track between the contacting faces. This prevents leakage and seal face wear resulting in *long seal life.*

"The long life and trouble-free service which your pipe line customers are experiencing with our seals in your 'Double Volute' Pumps, speaks well for this style of pump construction as compared to pumps of other designs."

Records of long mechanical seal life is one of the big reasons why Bingham "Double Volute" Pumps are preferred by major pipe line companies. Call your nearest Bingham office for more information... or write for "Double Volute" Bulletin.

Bingham SINCE 1921

DOUBLE VOLUTE PUMPS RADIAL BALANCE

BINGHAM PUMP COMPANY

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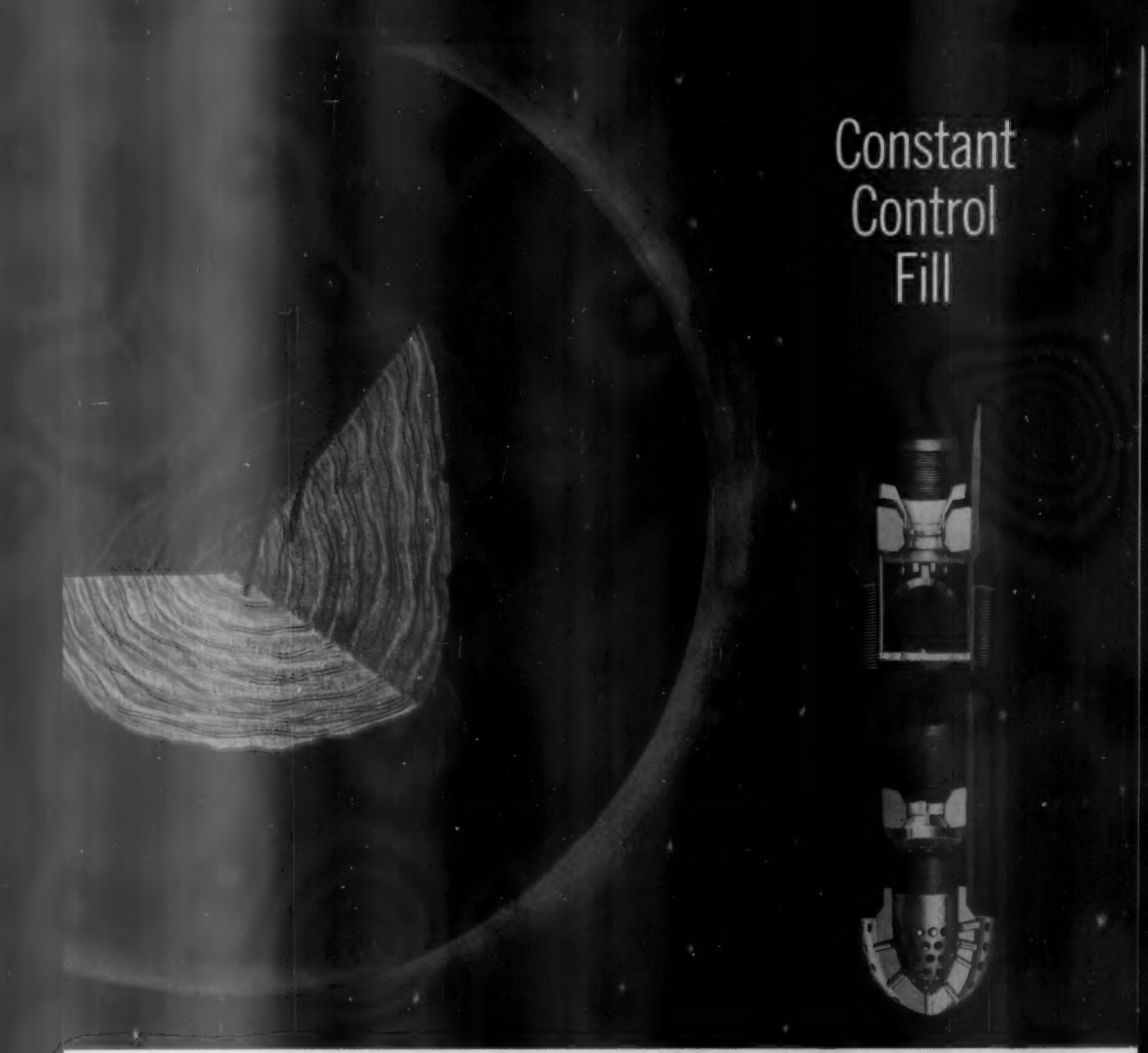


RECORD BREAKING PERFORMANCE

Rector Type 'O' Cementing Equipment insures constant control under all conditions

Rector Type "O" cementing equipment delivers outstanding performance with safety, proven in routine operations or at the end of the longest casing string ever run — 25,340 feet under the ground. Rector Type "O" is the ONLY automatic casing fill-up equipment that permits circulating the well at your option, then continuing to run pipe with controlled orifice fill from the bottom. A new ceramic choke that can be changed in the field is available for overcoming orifice wear from abrasive sands and insuring constantly controlled operation. A bullet shaped aluminum screening nose guides the shoe past ledges and obstructions. Tests prove that lost circulation materials of all kinds can be circulated through the perforated nose without danger of plugging.

Rector Type "O" fill shoes and fill collars are precision machined from high quality seamless steel. Internal parts are high strength aluminum alloy and can be easily drilled. Specify Rector equipment in your next cementing program. See your favorite supply store — or ask a Rector man for details.

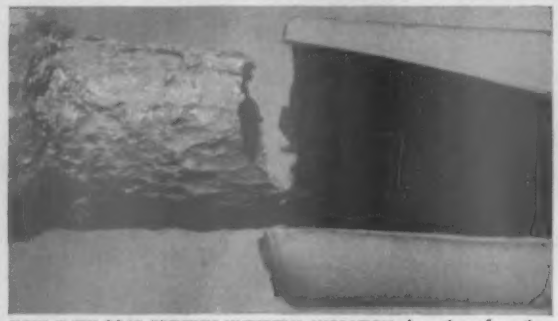
Rector WELL EQUIPMENT CO., INC.

1100 No. Commerce St.
Fort Worth, Texas

Making the Oil Industry Safer

Houston plant: 2215 Commerce Street Export representatives: Continental Supply Co., Mid-Continent Supply Co., Oil Well Supply Co.

CORROSION IS



HOW X-TRU-COAT PREVENTS UNDERFILM MIGRATION. A section of coating was removed from this sample before it was subjected to an eight-month salt crock test. Corrosion ravaged the unprotected metal, but was unable to penetrate X-TRU-COAT's tight plastic-to-steel bond. Cutting back of the coating revealed *no underfilm migration!*

X-TRU-COAT's polyethylene coating is easily cut back for welding. Joints are economically protected with plastic tape or cold-applied joint compounds. Bright yellow color reflects heat. Coating remains at lower temperatures, retaining its tough, abrasion-resistant properties.

SEALED OUT...

with Republic X-TRU-COAT Plastic-Coated Steel Pipe

Republic X-TRU-COAT more than meets requirements of your most severe corrosion applications. You can bury it in soils of different potentials, subject it to stray currents, lay it in the most aggressive soil. High-density polyethylene coating *seals out* electrical and chemical corrosion.

The tough yellow jacket is continuously extruded over a special, pressure-sensitive adhesive to form a moisture-proof, elastic bond with the pipe. Polyethylene plastic was chosen because it is one of the most inert materials available. Provides outstanding electrical- and chemical-resistance, offers negligible water absorption. And, since polyethylene retains its flexibility even at low temperatures, the coating is not damaged by bending or flexing.

The steel pipe is Republic Continuous Butt Weld or Electric Resistance Weld—uniformly round, ductile, and strong. Republic's constant quality control assures precise line-up of joints; trouble-free bending in field or shop; complete, *line-long* dependability.

X-TRU-COAT Plastic-Coated Steel Pipe is available in a wide range of wall thicknesses and diameters (through 5⁹⁄₁₆″ O.D.). Delivered ready for installation, X-TRU-COAT withstands the abuse of shipping, loading, trucking, and handling without damage. Learn more about the plastic-coated pipe that *seals out* corrosion problems. Contact your local Republic Sales Office for complete details and specifications.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

MEETING OTHER CORROSION PROBLEMS HEAD-ON!

FOR NEW AND REPLACEMENT USE—service entrance lines of Republic SRK are gaining wide acceptance. Corrosion-resistant SRK saves time and money in new connections through its low initial cost and ease of installation. On replacement jobs, SRK is pushed through existing line from tap to riser, eliminating costly trenching.

REPUBLIC CONTINUOUS BUTT WELD PIPE is known for excellent in-service dependability. Tight galvanized coating resists corrosion. Uniform ductility and strength assure easy workability, fine threading characteristics. Sizes range from ⅛″ through 4″ nominal. Mail coupon for further information.

REPUBLIC SEMI-RIGID PLASTIC PIPE resists highly corrosive chemicals, prevents scale build-up, yet costs no more than ordinary pipe. SRK is easy to handle and install. Cuts with hand- or hacksaw. Joints are quickly and permanently welded with brush-applied solvent and plastic fittings. Send coupon for complete information.

REPUBLIC STEEL CORPORATION
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Send more information on:

- ☐ X-TRU-COAT Plastic-Coated Steel Pipe
- ☐ Continuous Butt Weld Pipe
- ☐ Semi-Rigid Plastic Pipe

Name_____ Title_____

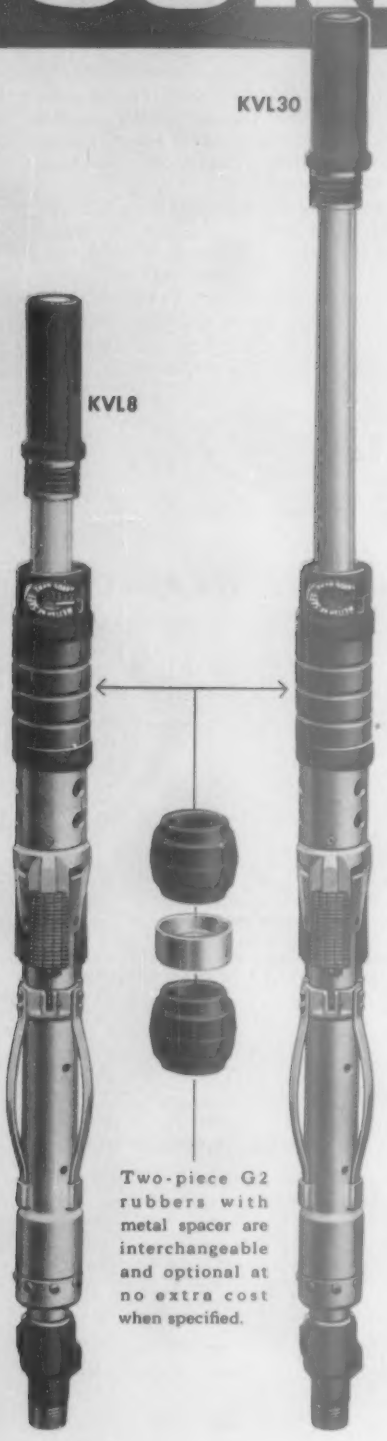
Company_____

Address_____

City_____ Zone_____ State_____

SAFE and SURE

GUIBERSON'S KVL PACKERS



Two-piece G2 rubbers with metal spacer are interchangeable and optional at no extra cost when specified.

With Automatic Latch

Operators who want extra assurance that a packer won't come unlatched going in, depend on Guiberson KVL packers. Rugged and durable, KVL packers have earned a reputation for dependable performance in deep and medium depth wells. These retrievable packers are easy to set and release, with ample bypass and positive seal. When running into a liner the KVL stays latched and drag springs provide an excellent guide — features operators like. For conserving gas energy and increasing production in flowing wells; for completing wells by circulation; for acidizing, repressuring and dozens of other uses, the KVL is unsurpassed.

- Made as the KVL30 with 30″ valve stroke or KVL8 with 8″ valve stroke for standard below-packer circulation. (Both packers also made with perforated mandrel for circulation above packer.) Available in casing sizes 5″ through 9⅝″.
- Valve has two independent sealing elements, a tapered metal valve and seat and a set of oil-resistant seal rings, affording double-sealed protection.
- Rubbers made of special oil and gas resistant compound. Will not vulcanize to casing — recover original shape when released.

SAFE THAN SORRY GUIBERSON BETTER BE

THE

GUIBERSON

CORPORATION

ESTABLISHED 1919

DALLAS, TEXAS U. S. A.

Continental-Emsco's PRECISION HERE

.. keeps wells pumping longer

C-E's D+B pump shops are manned by trained, field experienced specialists using modern equipment and methods. The result: *superior service.*

Precision micrometers, gauges and special test equipment are used to check OD of plungers .. ID of liners and tubes .. pressure-test pumps after assembly. Special C-E designed aligning mandrels and clamps are used to accurately assemble and repair sectional liner pumps and composite plungers. Special vises prevent distortion of tubes and plungers. The use of friction tongs eliminates pipe wrench marks .. open doors for corrosive fluids. Vacuum testers are used to test fluid seal of valves. Desanding equipment is used to remove frozen plungers and entire pumps from sanded joints often saving considerable money by salvaging parts. Cooking vats and steam cleaning equipment remove paraffin and other deposits and also eliminate corrosive effects of salt water during pump repair. Each shop has special equipment to handle the popular pumps of the area.

Continental-Emsco's training program keeps personnel "up" on all types of pumps, improved methods of assembly and new materials. You always get a longer *pumping* run for your dollar at Continental-Emsco D+B pump shops.

For Service that Sings.. Equipment that Hums.. Go..

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Serving the Oil and Gas Industries ... Worldwide

P908

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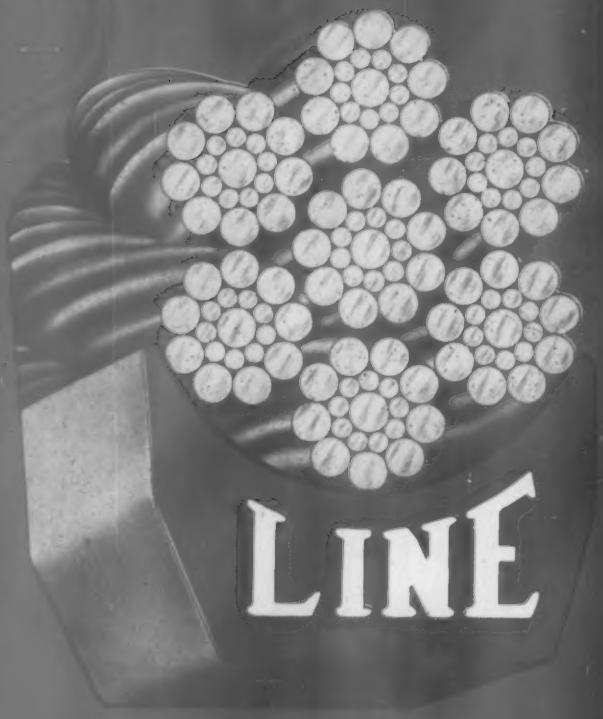
Season's Greetings



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They Say—

Another prof speaks up

Dear Sir:

As a currently active university professor and consulting geologist who, incidentally, has spent the past 16 years in the geological profession associated with several oil companies, it is appalling to me to view the near-sighted opinions of my colleagues regarding the 27½% depletion allowance as evidenced in your November 16 issue of The Oil and Gas Journal ("Professors Tee Off on Depletion," p. 132).

It is obvious from the outset that several of these college professors have not had enough basic industrial contact or experience to enable them to differentiate between a monkey wrench and a monkey board, much less to consider themselves in a position of some authority as concerns depletion allowance.

These misguided professors undoubtedly never have been faced with the responsibility for spending several hundred thousand dollars for a wildcat exploration which, after drilling, proved to be a dry hole.

In this event, it is probable that they would take a rather dim view of their current attitude concerning depletion allowance.

This subject is much too involved for a lengthy discussion here. I would remind these individuals that personal initiative, a healthy industrial environment, together with strong competitive forces helped to make and to keep our country great.

Richard W. Harding
State College, Pa.

Federal loans for oil men?

Dear Sir:

Would it not be possible to alleviate greatly the world oil glut by even more stringent proration of producing oil wells in the United States?

The reduced sales of domestic oil producers could be offset by interest-free loans to these oil companies by the federal Government. In this way the producing oil companies will still get the same cash flow as they do now so they can continue financing their exploration activities for finding new oil.

Thus, more oil can be imported from the outside countries without upsetting the domestic oil price structure. Also, foreign oil producing countries'

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by Foxboro...

engineered for the most advanced transmission techniques

Telemetering matched in performance with famous Foxboro instruments — that's the Foxboro Teletax Telemetering System.

Through use of impulse-duration signals, Teletax electrically transmits measurements of a remotely-located variable to the central control station. Here, the Teletax receiver records the duration of impulse, which is directly proportional to the measured variable.

The Foxboro Teletax System is noted for its simplicity, its versatility, and its high sustained accuracy. For a transmission medium, it can use either AC or DC, an audio frequency carried on a transmission line, or radio or microwave impulses. Sustained accuracy is 0.5% of full scale.

TELETAX RECEIVERS

Teletax receivers include: Single or Dual Receivers; Multi-Record Receivers for recording up to 6 separate measurements on one chart; and Teletax Receiver-Controllers for automatic operation. And the Teletax signal can be simply converted to digital information.

TRANSMISSION LINK

With Foxboro's Teletax Telemetering System, you can use the most advanced transmitting techniques: two wire lines, power lines, radio or microwave. As many as 25 different signals can be handled in each direction, simultaneously.

TELETAX TRANSMITTER

The Teletax Transmitter houses either one or two standard Foxboro measuring elements — plus the Teletax transmitting mechanism. It will transmit to a control center hundreds of miles away just as easily as to one nearby. It also indicates or records locally if desired.

The Teletax Transmitter needs no periodic maintenance whatever, while the receiver requires only occasional oiling. And the receiver has a minimum of mechanical components to wear — no clutch to slip or jam.

Foxboro Teletax Systems are now in wide use on natural gas systems, water works, oil fields, power plants, steel mills, etc. Write for Bulletin 17-11C — it gives all the details. **The Foxboro Company, 6012 Neponset Avenue, Foxboro, Mass.**

FOXBORO

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TELETAX TELEMETERING

anger at our new oil imports quota system will be appeased. But, most important of all, the United States will be rapidly building up its domestic oil reserves because our exploration will continue unabated and our production rate will be reduced.

In the long run, the cost of this program to the American taxpayer will only be the interest that the federal Government must pay to get the money to loan the domestic oil producers.

Admittedly, in the beginning, the cash drain on the American taxpayer will be greater when the loans are made to the oil producers, but they will get their money back eventually when the oil is needed.

I would be most interested in hearing your comments on the above.

John M. Bradley
New Projects Manager
Godfrey L. Cabot, Inc.

(Editor's note: It seems to us a pretty final "goodbye" to free enterprise and the law of supply and demand. Any other comments?)

Now is the hour

"We of this company believe that an important share of the job of checking inflation must fall upon the shoulders of industrial management. We believe management can and should do a great deal to close the inflationary gap between the trends in wages and national output per man-hour by:

". . . Considering the interests of all those involved in setting pay and price levels—employes, stockholders, customers, and the general public.

". . . Doing our part in improving national output.

". . . Avoiding long-term inflationary union contracts which guarantee pay increases automatically in anticipation of increased 'productivity' regardless of future economic developments.

". . . Resolving to consider carefully increases, either in the form of wages or fringe benefits, on their merits in order to maintain the necessary balance between national output and wages.

"It is possible to close the inflationary gap, but only by the combined efforts of employes, unions, and management in controlling the factors which have contributed to the disparity. Inevitably, if inflation is to be stopped, output must be given the opportunity to keep pace. We think the time to start is right now."

R. G. Follis, chairman of the board, Standard Oil Co. of California, in an editorial in the October issue of the Bulletin, company magazine.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JANUARY

11-13 Alberta Society of Petroleum Geologists, first international symposium on Arctic geology, Hotel Palliser and Jubilee Auditorium, Calgary.

11-15 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac Hotel, Detroit.

15-16 Association of Oilwell Servicing Contractors, annual meeting, Baker Hotel, Dallas.

17-19 Kansas Oil Men's Association, annual convention, Broadview Hotel, Wichita.

18-20 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

22 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 Plant Maintenance and Engineering Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-4 Instrument Society of America, in-

In the heart of
downtown Miami...
Elegant
"Away from home" living
Magnificent bayfront accommodations — one-of-a-kind rooms and suites, designed for connoisseurs, comfort seekers, cosmopolites from the world over!
"Summit" meetings of top people . . . every day at the world-famed Top O' the Columbus, 17 floors up! Gourmet fare, rare wines from the Columbus wine cellar; spectacular views of ocean, city, and bay!
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THE 1ST NATIONAL BANK OF SHREVEPORT
LOUISIANA'S LARGEST BANK
ROBERT F. CASHEN, Assistant Vice President
Manager, Petroleum Department

strument-automation conference and exhibit, Rice Hotel and Houston Coliseum, Houston.

8 Alberta Division of Canadian Petroleum Association, annual meeting, Hotel Palliser, Calgary.

7-10 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Billings, Mont.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical Engineers, meeting, Biltmore Hotel, Atlanta.

24-25 Wisconsin Petroleum Association, annual convention and exhibit, Schroeder Hotel, Milwaukee.

24-26 National Association of Corrosion Engineers, Tulsa section, eleventh annual corrosion short course, Mayo Hotel, Tulsa.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

2-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel Dallas.

7 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16 Petroleum Equipment Suppliers Association, eastern district membership meeting, Duquesne Club, Pittsburgh.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

22 Petroleum Equipment Suppliers Association, Gulf Coast district membership meeting, Shamrock Hilton Hotel, Houston.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

28-30 Western Petroleum Refiners Association forty-eighth annual meeting, Hilton Hotel, San Antonio, Tex.

29-31 American Power Conference, annual meeting, Sherman Hotel, Chicago.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita.

APRIL

3-8 Engineers Joint Council, sixth nuclear congress, New York.

4-7 Oil Heat Institute of America, annual convention, Park-Sheraton Hotel, New York.

4-7 National oil heat and air-conditioning exposition, Coliseum, New York.

5 Petroleum Equipment Suppliers Association, southern mid-continent district membership meeting, Statler Hilton Hotel, Dallas.

5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.

12-14 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, conference and exhibition, Municipal Auditorium, Kansas City.

19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.

20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

21-22 Texas Technological College, seventh annual West Texas oil lifting short course, Lubbock, Tex.

21-23 Society of Economic Paleontologists and Mineralogists, Permian basin section annual meeting and field trip, Abilene, Tex.

24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.

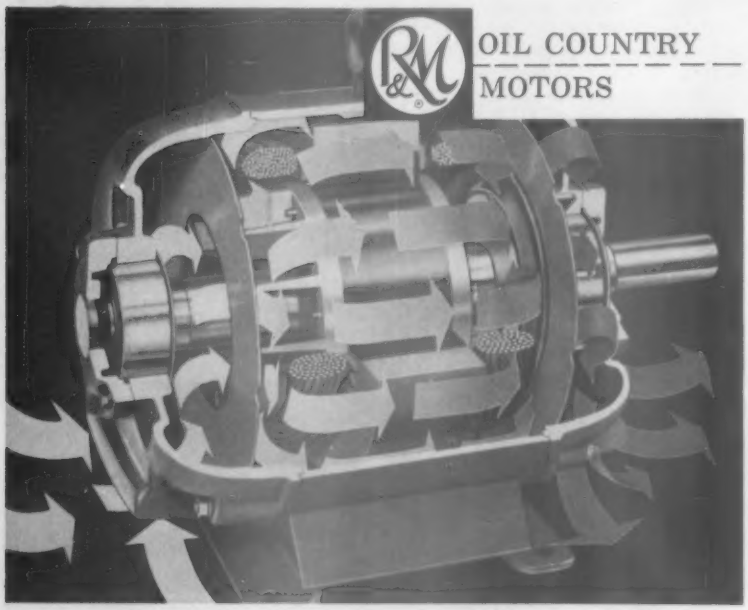
25-27 Southern Gas Association, convention, Buccaneer and Galvez hotels, Galveston.

25-28 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

25-29 American Welding Society, annual meeting and welding exposition, Los Angeles.

26 Petroleum Equipment Suppliers Association, Pacific district annual membership meeting, Ambassador Hotel, Los Angeles.

27-29 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.



COOL R&M Performance

Increases bearing grease life 52%

New Robbins & Myers "All Weather 40" Oil Country Motors

have a heat rise of only 40° C. with rodent screens installed, compared to 55° or higher for other makes of motors. A leading bearing manufacturer proved grease lasts 52% longer when rise drops from 55° to 40° C. Cooler performance by R&M motors means less maintenance, longer bearing life, longer service intervals. When you consider buying motors from 1 through 200 HP, remember that Robbins & Myers Oil Country motors give you these important maintenance savings. Write for Bulletin 520-OG

ROBBINS & MYERS, INC.
MOTOR DIVISION • SPRINGFIELD, OHIO

before...

...and after

with *Visco* corrosion control!

HERE are several sets of typical before and after coupon test figures in wells now getting Visco Anti-Corrosion Treatment. Estimate the *tons* of well equipment metal saved by Visco Treatment, and you get an idea of the *dollars* saved in labor and replacement costs . . .

Well	Maximum Weight Loss—Mils/year	
	Before Visco	With Visco
1.	11.00*	0.02
2.	4.90	0.40
3.	8.10*	0.86
4.	7.50	0.08
5.	16.00*	1.30

** These wells receiving "anti-corrosion" treatment. Replaced by Visco.*

1 mil=.001 inch. A corrosion rate of 216 mils per year means that the corrosive attack, if uniform, would have corroded away the entire surface of the metal to a depth of .216 inches in a year. However, the real danger of high corrosion rates, as the coupon shows, is the much deeper and faster penetration occurring at localized areas.

These are not super-success figures. Chances are high that Visco can equal or better these results in *your* wells. Phone, Houston, JAckson 8-2495, or write for positive Visco action today.

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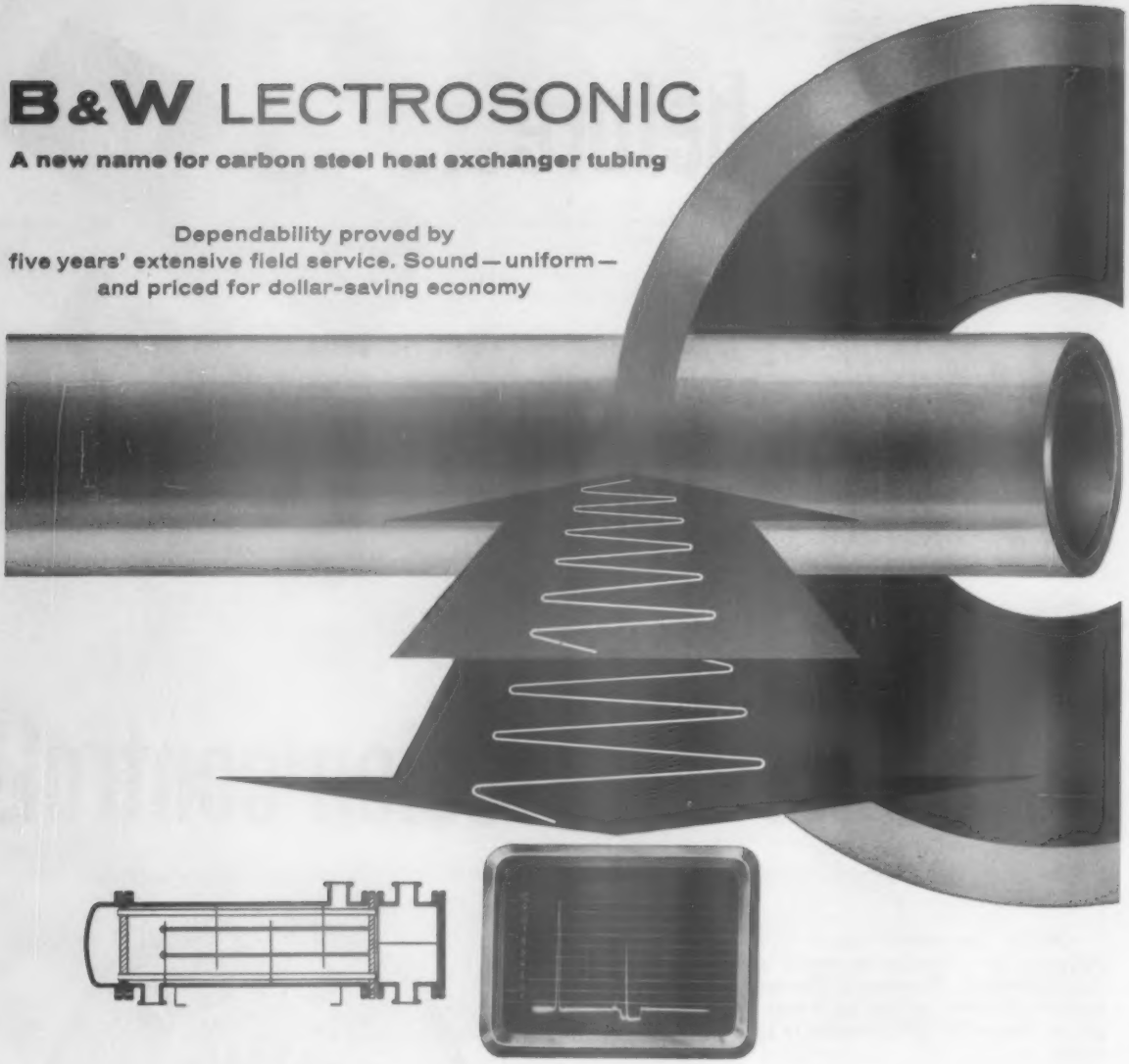
Incorporated
1020 Holcombe Boulevard • Houston 25, Texas

Visco® ... CONSISTENTLY EFFICIENT OIL FIELD CHEMICALS

B&W LECTROSONIC

A new name for carbon steel heat exchanger tubing

Dependability proved by five years' extensive field service. Sound—uniform—and priced for dollar-saving economy



Now, B&W brings you a new concept in heat exchanger tubing—B&W LECTROSONIC. Produced under the most exacting quality control methods in the industry, LECTROSONIC tubing fits right, and rolls in easily because it's dimensionally accurate, and uniform.

Continuous ultrasonic inspection—plus destructive and hydrostatic testing, visual inspection, and magnetic particle inspection, are five ways used to check the weld of B&W LECTROSONIC Tubing for your assurance of dependability.

B&W LECTROSONIC Tubing was developed to meet the needs of the petrochemical industry for an electric resistance welded carbon steel tube that is easily workable, strong, and less costly than seamless tubing which it is designed to replace.

Produced in all standard sizes. Available now through distributors or direct from B&W.

Write for B&W Bulletin TB-431 for full information, or call your nearest B&W District Sales Office. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

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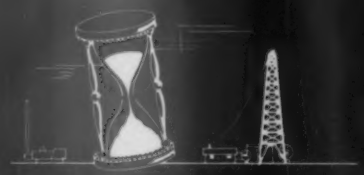
B&W THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals



the Journal said...

50 years ago

December 20, 1909

The Texas Co. moves into its new office home in the 10-story Jones Building on Main Street, Houston.

Preston, Oklahoma's newest oil-boom town, is beginning to look like another Kiefer. Located in recently opened field being developed at Hamilton Switch, in Okmulgee County, it boasts 150 houses already with the usual complement of tents and covered wagons.

Top Gulf Coast field this week is Humble, north of Houston, with daily production of 7,800 bbl. and 22 active drilling operations. Jennings, in Louisiana, is second in production, making 5,250 bbl. daily, but gives way to Spindletop in drilling with 16 operations.

25 years ago

December 20, 1934

Nelson Rockefeller, son of John D., Jr., makes airplane survey of vast East Texas oil field in company with a group of leading Dallas oil and business men.

Arrangements completed by Commodity Exchange, Inc., for opening first week in February of first exchange to operate in oil industry in 40 years. It will deal in futures covering crude oil and gasolines. Mid-Continent 36°-gravity crude made basis of trading.

William K. Whiteford, vice president in charge of production of Barnsdall Oil Co., takes position as vice president of British-American Oil Producing Co.

10 years ago

December 22, 1949

Independent Refining Association formed as broadened national trade organization to succeed the recently reactivated Gulf Coast Refiners Association. Headquarters remain at Houston with Harry Leyendecker, vice president of Eastern States Petroleum Co., temporary chairman of group's executive committee. Aggressive action planned to defend position of members.

Ringwood field, in Major County, Oklahoma, becomes Mid-Continent's leading field. New extensions spread potential productive area 5 miles both east and west and north and south. Eighteen rotary rigs are running.

Gas-turbine locomotives of large capacity being developed expected to open new markets for low-grade oils and make some types of diesel engines as obsolete as the diesel now is making the steam locomotive.

JOURNALLY SPEAKING

Visions of Sugar Plums

IF CHRISTMAS usually brings you several turkeys, a couple of hams, and a case or two of bourbon from supply men, service companies, and contractors, trim your expectations this year.

This Christmas just isn't going to be as lush as those in the past.

It's estimated that $260,000,000 is spent each yule season for "industrial giving," and the oil industry has always accounted for a big chunk of this.

But in the last 3 years there has been a steady decline in oil spending, and this year it will be at the lowest point since the drop started.

At least that's what a poll of supply and service companies shows. There are two big reasons:

1. Giving has got out of hand. Company gift lists have grown steadily, and it's difficult to cut anyone off.

One company this year dropped its giving to a 56-cent item, but found it still will spend more than $10,000. Some companies giving $2 to $10 gifts—the range for most gifts—will pick up tabs of $30,000 and up.

2. The "Thou Shalt Not" notes are on the increase. More oil-company executives are writing letters discouraging gift-giving, and nearly all of them express intolerance with "extravagance."

Many companies still swear by holiday giving as a sure-fire business and good-will getter. And, they have surveys to show that their programs bring in business.

And all the pressure isn't from the oil companies. On the other side are 1,100 makers and sellers of holiday gifts. They've been worried for fear that the extravagances of a few might cut heavily into the established practice. They've formed assoications to promote gift-giving, and they're promoting rules for doing it. Givers, they say, should:

... Keep gifts modest.

... Personalize them.

... Be sure they're useful.

... Deliver them to the home, not the office.

Another thing that scared the gift makers was the growing practice of Kentucky Derby trips, bowl-game trips, fishing and hunting expeditions, and other entertainment to replace the giving.

And one supply man says: "The business you get depends on how far you take the customer and how long you keep him there."

But this year he's in a minority. More and more companies are looking for solutions to their good-will problem.

Some have found a way out. Others are still looking. A few have gone abruptly to the calendar and Christmas card.

One company, which used to spend about $22,000 a year, reasons this way:

"We found what we knew all along—a smile and personal contact can't be beat in getting and holding business."

Some are now giving to charity, then notifying 500 to 3,000 or more clients and customers a donation has been made in their name.

About half of the gift budgets are charged to advertising. Another 25% charge them to sales; about 20% are promotion and overhead; and the rest usually are filed under "special expense."

Some abuses come about because of the stature of the receiver, rather than extravagance of the giver. One oil-company vice president last Christmas was given 28 turkeys, 19 cases of grapefruit. It all went to a boys' home.

What will happen next year, nobody yet knows. This year the picture will be mixed. There will be some lavish gifts. There will be a lot of turkeys, hams, and whiskey gift-wrapped by suppliers for oil-industry buyers.

But one thing seems certain. There won't be quite so many as last year.

Merle Blakely.

Only the BAKER Packer does so many jobs so well!

Thousands of varied applications throughout the world are proof of the versatility and performance of this most widely-used drillable production packer.

The basic design has been continually improved to withstand higher and higher temperatures, record-breaking depths and pressures. It has kept pace with the need for more complex multiple completions... yet it is these long-proven, basic features which contribute so largely to its versatility and usefulness...

- *Holds high pressure differentials from above or below—even under temperatures in excess of 300°F.*
- *Pack-off is independent of set-down weight or tension.*
- *Tubing String can be removed without disturbing the packer.*
- *Use it as a squeeze and testing tool or as a temporary or permanent bridge plug in conjunction with any production application.*

Though designed for permanent high-performance pack-off, special emphasis has always been placed on drillability. Now, through the use of the new Baker Packer Milling Tool, drill-out time has been reduced by as much as 75%.

Today, more than ever—Only the Baker Packer does so many jobs so well!

BAKER RETAINER PRODUCTION PACKER PRODUCT NO. 415-D

BAKER

BAKER OIL TOOLS, INC. • HOUSTON • LOS ANGELES • NEW YORK

Conservation progress: An exercise in futility

THE YEAR'S greatest exercise in futility was the recent meeting of the Interstate Oil Compact Commission.

With the industry wallowing in a surplus of producing capacity and with increased efficiency as the price of its survival, the meeting utterly ignored one of the most pressing problems of the day: The role of state conservation laws in coping with excess capacity.

At the Philadephia meeting everybody had a good time but nobody did anything constructive.

THE COMPACT HAS GONE TO SEED. It interests chiefly veterans of past achievements, political functionaries content to continue their comfortable routine, and playboys who just come along for the ride.

It has no leadership, no program, no vision. Many of its committees do little more than mull over their previous reports, wonder out loud whether they ought to be doing something new, and postpone action to the next meeting.

The big problem facing the oil industry is how to live with an excess producing capacity for the next several years.

State conservation laws are a legal—and could be a very effective—means of containing the excess capacity, equitably spreading the burden of carrying it, and reducing unit costs of production on a curtailed volume.

But in too many instances they operate to increase economic waste, foster inefficient methods, and force increases in producing capacity.

With a few minor exceptions, all state conservation laws and practices, particularly those that fell into their present patterns a couple of decades ago, need to be reexamined, modernized, and reoriented to fit today's needs. Both technological knowledge and economic needs have changed, but regulatory practices are still in the dark ages.

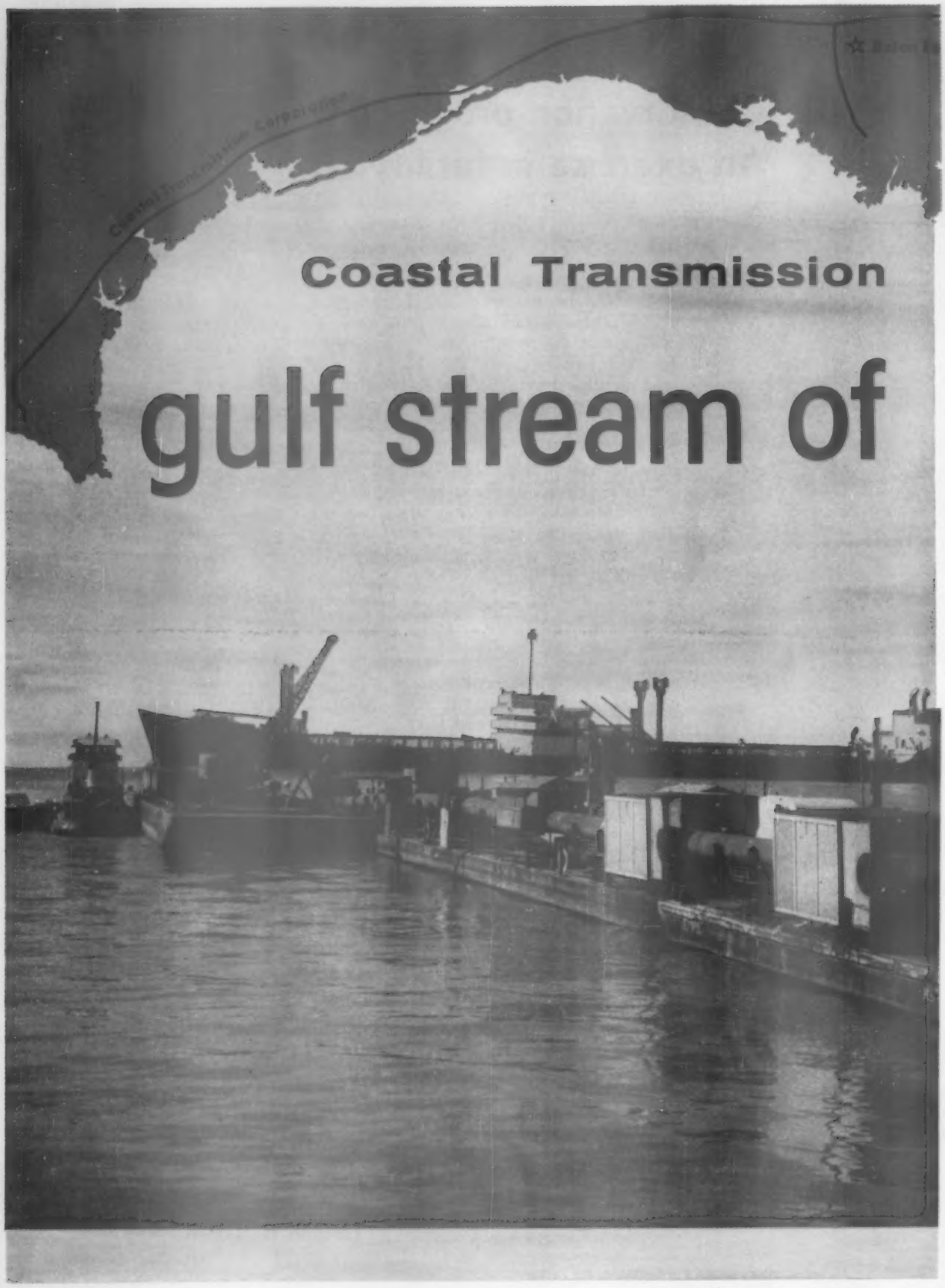
The failure is due partly to inertia in state officials, partly to lack of vision and aggressiveness in too much of the industry. Some companies and individuals are campaigning for improvement, but they are making precious little progress.

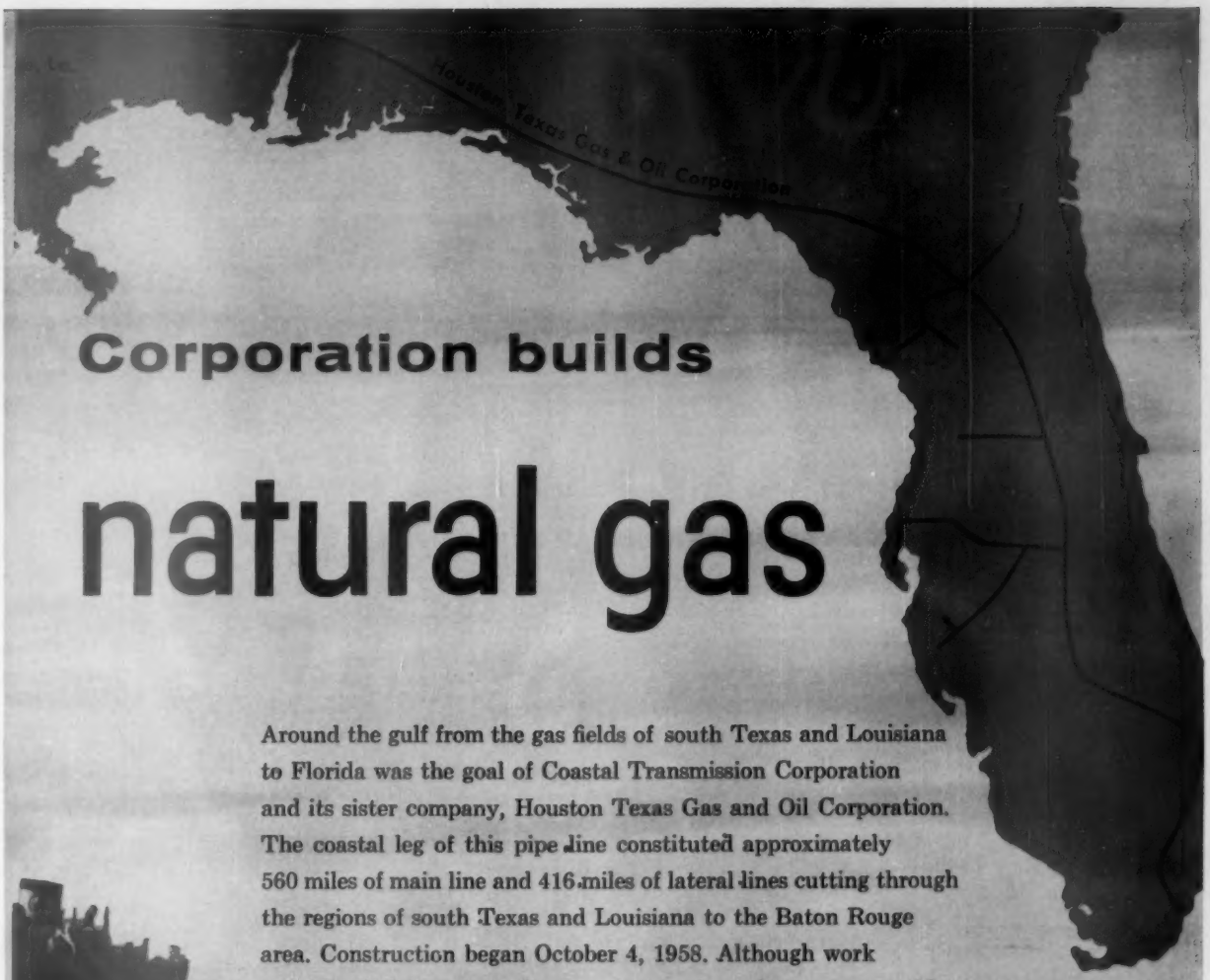
The states should face up to their responsibilities, the industry should spur them into action, and the Compact should be the sounding board and the torch bearer for modernized, enlightened regulatory practices. Instead—mainly silence and indifference.

HERE IS THE FRUSTRATING PICTURE of an industry that knows its problem, has a remedy at hand, but seems helpless to act.

Warnings are being sounded that if the states don't put their conservation house in order, the federal Government will do it for them.

Will it take a real threat of federal control to save the industry from its follies, as it did in the 1930's?


Coastal Transmission
gulf stream of



Corporation builds

natural gas

Around the gulf from the gas fields of south Texas and Louisiana to Florida was the goal of Coastal Transmission Corporation and its sister company, Houston Texas Gas and Oil Corporation. The coastal leg of this pipe line constituted approximately 560 miles of main line and 416 miles of lateral lines cutting through the regions of south Texas and Louisiana to the Baton Rouge area. Construction began October 4, 1958. Although work was impeded by extremely swampy terrain and an unseasonably wet spring, the line was completed by June of 1959.

A. O. Smith furnished 167.5 miles of 24-inch pipe and 91 miles of 20-inch main line pipe that spans this coastal region.

For almost 30 years . . . A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is found in every important pipe line project.

CROSSING THE BAY — Approximately 11 miles of 24-inch pipe was laid across Galveston Bay. Special techniques had to be employed in crossing the busy Houston Ship Channel. All of Coastal's river crossings were submerged.

Through research ...*a better way*

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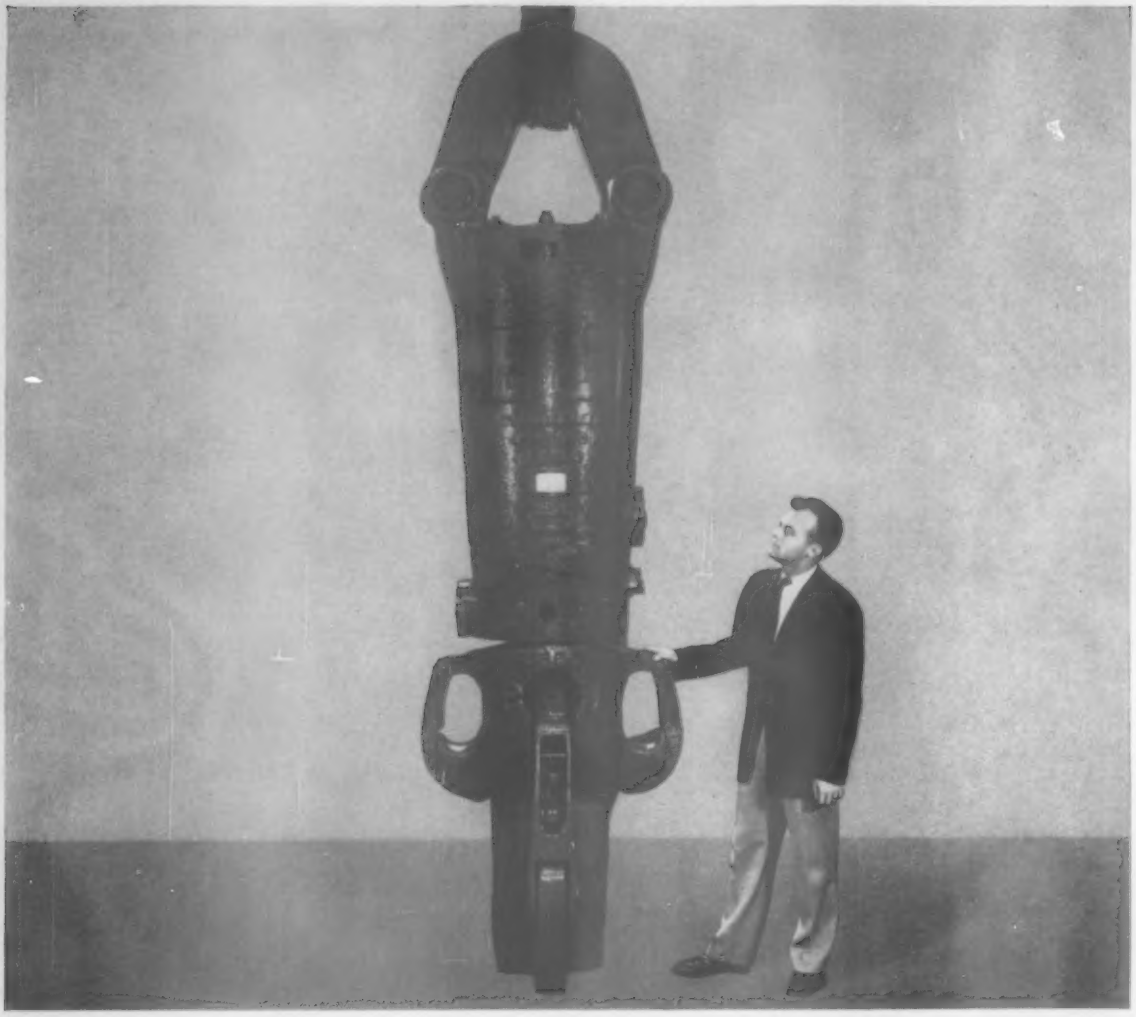
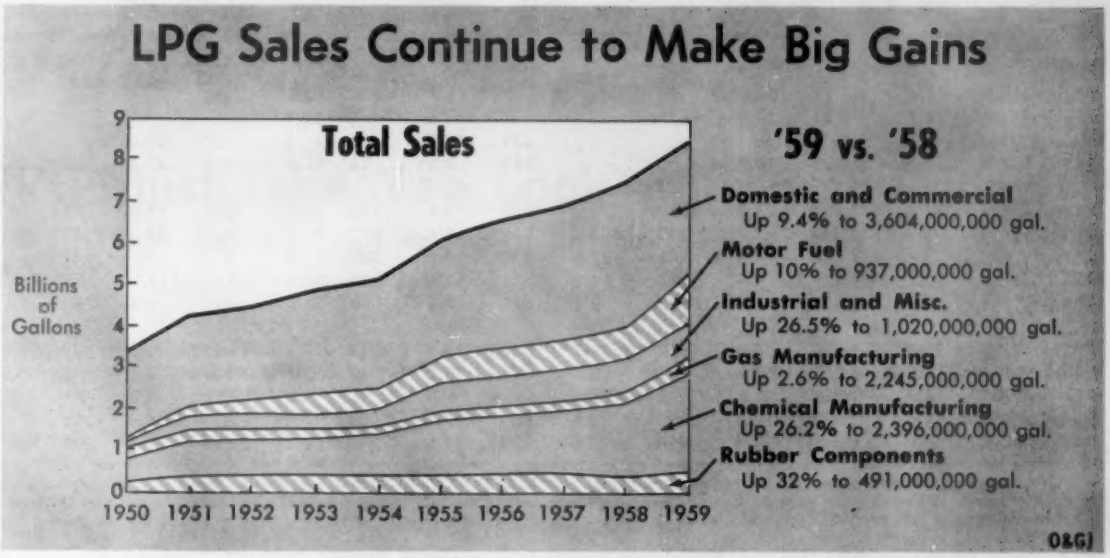


NICKEL MAKES ALLOYS PERFORM BETTER LONGER
The largest hook ever made for drilling oil wells stands nearly 12 feet high, weighs just under 5 tons. Made by Byron Jackson Tools, Inc. of Los Angeles, the huge hook makes effective use of nickel alloy cast steel (.70% Nickel, and other alloying elements) for 25 separate components. Normalized and tempered, this steel develops more than double the yield strength of unalloyed cast steel.

World's largest. With a rated capacity of 500 tons, this giant drilling hook easily handles the loads encountered in deep drilling, even down past 5 miles. That's because its nickel alloy steel cast parts give increased strength without lowering ductility...provide improved wear resistance without brittleness ...permit greater safety. When you want rugged-duty parts in your equipment, specify cast nickel alloy steels!

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N.Y. INCO NICKEL



LPG Sales Climb to New All-Time High

• Biggest percentage gain in 1959 was racked up by sales to the chemical and rubber industries. But the big market is still for household and farm use and as a motor fuel.

LPG SALES continue to boom as demands of the chemical manufacturing, domestic, and motor-fuel markets show no sign of slackening.

The tremendous growth of the LPG industry was clearly illustrated this year as sales rose to a billion-gallon month in December from a billion-gallon year in 1944. Total sales for 1959 are estimated at 8,693,000,000 gal., an increase of 1,231,000,000 gal. or 16.5% over 1958.

These were the figures released by George R. Benz, W. F. DeVoe, and Paul W. Tucker of Phillips Petroleum Co. in their year-end review of the LPG industry.

Biggest market . . . Domestic and commercial sales for household and farm uses are still the largest volume market for LPG with a 3.6 billion gallon demand for 1959. However, their per cent of the total sales decreased from 44.1% in 1958 to 41.5% in 1959.

The most important factor in domestic growth continues to be house heating as home owners convert from other fuels to LPG. Also new housing starts were up 18% over 1958 and many of these new homes are enjoying LPG heat.

Agricultural uses of LPG continue to expand, especially for grain drying and tobacco curing, brooding of chickens, turkeys and pigs, flame cultivation, and weed burning.

Although the extension of natural-gas pipelines has displaced LPG in some areas, particularly Florida, the over-all effect has been to stimulate interest in LPG as well as natural gas and create the need for additional standby plants.

Motor fuel . . . LPG sales for motor fuel increased 10% to 937 million gallons, Phillips reports.

Use in industrial lift and tow trucks continues to show the fastest rate of increase, although farm tractors remained the largest volume user. Tractors were used more in 1959 than last year due to more favorable weather. This drier weather also caused an increased use in LPG for irrigation pump engines.

The use of LPG for cargo-truck refrigeration and heating, ready-mix concrete trucks, electric generator sets, and local delivery truck fleets continued to show big gains.

More service stations and truck stops added LPG motor-fuel facilities in 1959. This is another encouraging factor in the motor-fuel market.

Industrial, miscellaneous . . . Greater refinery fuel use accounted for a large portion of the 214 million gallon increase in this category. A 26.5% increase over 1958 included LPG used in secondary recovery of crude oil.

Although the use of LPG as a pro-

Here's How LPG Markets Are Expanding

(MILLIONS OF GALLONS)

YEAR	TOTAL Vol.	TOTAL % Increase	DOMESTIC AND COMMERCIAL (*) Vol.	DOMESTIC AND COMMERCIAL (*) % Increase	MOTOR FUEL Vol.	MOTOR FUEL % Increase	INDUSTRIAL AND MISCELLANEOUS Vol.	INDUSTRIAL AND MISCELLANEOUS % Increase	GAS MANUFACTURING Vol.	GAS MANUFACTURING % Increase	CHEMICAL MANUFACTURING Vol.	CHEMICAL MANUFACTURING % Increase	RUBBER COMPONENTS Vol.	RUBBER COMPONENTS % Increase
1925	0.4	7.2	....	....	....	....	....	....	....	....	....	....	....	....
1930	18	81.4	12	100.0	....	....	2	46.7	4	60.0	....	....	....	....
1935	77	36.2	21	20.9	....	....	48	47.6	5	20.4	....	....	....	....
1940	313	40.2	134	53.1	....	....	124	32.8	20	31.4	35	29.0	....	....
1945	1,277	20.4	533	19.7	....	....	257	0.8	54	17.4	224	47.5	209	28.8
1950	3,483	22.8	2,022	24.3	130†	....	226	33.4	252	5.2	624	14.6	228	28.5
1951	4,227	21.4	2,167	7.1	290	123.4	269	19.4	282	11.9	845	35.2	375	64.1
1952	4,477	5.9	2,266	4.6	371	27.8	339	25.8	260	–7.8	871	3.1	371	–1.0
1953	4,932	10.2	2,479	9.4	498	34.5	374	10.4	222	–14.4	967	11.1	391	5.3
1954	5,126	3.9	2,627	6.0	547	9.8	402	7.3	192	–13.7	1,050	8.6	308	–21.2
1955	6,123	19.5	2,801	6.6	652	19.1	556‡	38.5	214	11.4	1,493§	42.2	406	32.0
1956	6,636	8.4	3,001	7.1	773	18.7	630	13.3	212	–0.7	1,601	7.2	418	2.9
1957	6,939	4.6	3,067	2.2	805	4.1	685¶	8.7	231	8.9	1,732	8.2	418	0.0
1958	7,462	7.5	3,294	7.4	852	5.9	806	17.7	239	3.4	1,899	9.6	372	–11.1
1959	8,693	16.5	3,604	9.4	937	10.0	1,020	26.5	245	2.6	2,396	26.2	491	32.0

* Householeating and other household and farm uses. Included also is LPG sold by domestic distributors but used for commercial or industrial purposes. † For all years prior to 1950 the motor-fuel volumes are included in the industrial and miscellaneous. ‡ Includes more complete coverage of refinery fuel. § Includes more complete coverage of LPG mixture streams containing ethane and methane. ¶ Inc ludes volume used in secondary recovery.

Total sales for all years except 1959 were obtained from Bureau of Mines reports, as were distribution figures for the years 1935 through 1958. All other figures are Phillips.

pellant in pressurized containers of insecticides, paint, shaving, etc., is still a small portion of the industrial market, it expanded rapidly in 1959 and should continue this growth in 1960.

Gas utilities consumed 245 million gallons of LPG in 1959, according to Phillips. Extension of natural-gas lines and increased heating loads caused utilities to continue their interest in large volume storage facilities for peak shaving and one mined-storage cavern was placed in operation during the year.

Chemical and rubber . . . Sales of LPG as a raw material for the manufacture of chemicals and chemical intermediates were up 26.2% over last year to a total of 2,396 million gallons. Expanding markets for existing and new petrochemicals along with the general economic upturn largely accounted for this outstanding gain.

New ethylene plants to handle the increasing demands for polyethylene, ethylene oxide, and ethyl alcohol will continue to consume large volumes of propane and butane. Polyethylene sales alone are expected to exceed one billion pounds for 1959.

LPG will also be popular as a feed stock for polypropylene, a new entry in the plastics field. Butanes are in big demand for motor-fuel blending, production of motor-fuel alkylate, isomerization of normal butane, and the manufacture of synthetic-rubber components.

During 1959, 491 million gallons of LPG were used for manufacturing synthetic rubber, Phillips estimates. This increase of 119 million gallons,

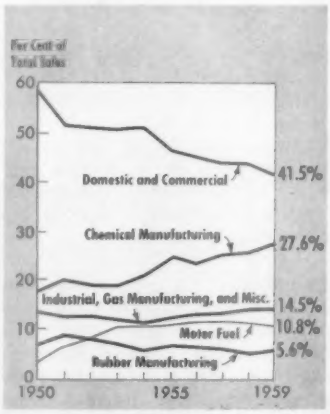
How the LPG market is changing

NINE YEARS ago almost 60% of all LPG sold went into domestic and commercial uses. This year the figure has dropped to 41.5%, and the big gainer is chemicals.

Indicating the tremendous growth of the petrochemical industry, chemical manufacturing has increased its use of LPG from around 18% of the market in 1950 to 27.6% for 1959. This large consumer should continue to take a bigger share of the market as the demand for plastics and similar end-use products increases in the years ahead.

The portion of the market taken by domestic and commercial sales has been dropping steadily since 1954, but this is no reason for alarm. The 3.6 billion gallons sold in 1959 was still a whopping 9.4% volume increase over last year, and 1960 should bring more of the same.

Other phases of the LPG market have remained fairly constant over the past few years.



or 32%, over 1958 was attributed to the big 1959 automobile market.

The combined volumes of LPG used for making chemicals and synthetic-rubber components was over 33% of the total LPG sales for 1959.

Supply, transportation . . . LPG production increased 18% over 1958, but this included mixed streams going to petrochemical use and refinery fuel. Eleven new plants and several expansions were completed in 1959 and 16 other plants are planned for 1960.

Expansion of transportation facilities slowed a little this year. One existing products pipeline was expanded and two short lines were placed in operation in the Southwest. One new tanker was placed in LPG service.

Large volumes of LPG will soon be barged to Alaska on a year-round basis from the State of Washington. This should provide an expanded LPG market in Alaska.

With a year of record increases in sales under its belt, the LPG industry is looking for another big year in 1960.

And management of large oil companies is paying more attention to LPG. This was clearly indicated by the establishment of an LPG committee in the Division of Marketing at the API meeting this year. This new committee should help create a better atmosphere for the LPG industry, and should help the industry boost its sales past the record figures of 1959.

FPC Must Take New Look at Transco Prices

- Supreme Court reversal tosses the case back in the lap of commission, which must decide if prices are justified in light of CATC court ruling.

THERE was bad news from Washington last week for natural-gas producers.

Just how bad won't be known for some time. The reason is there's wide divergence of opinion as to the effect of the latest round which producers have lost in the U. S. Supreme Court.

The high court ordered the Federal Power Commission to reconsider its decision approving 22.4 and 23.3-cent prices (including Louisana tax reimbursement) for gas purchased from 26 producers by Transcontinental Gas Pipe Line Corp.

The court directed the U. S. Court of Appeals in Philadelphia to remand the case to the FPC for reconsideration and redetermination in the light of the CATC ruling 6 months ago. It thus reversed the circuit court which had held in August that the CATC requirement of justifying initial prices had been met (OGJ, Aug. 10, p. 70).

The Supreme Court wants FPC itself to determine whether the prices are justified in view of the CATC ruling which was made after Transco certificates were approved without price conditioning.

Effect of ruling . . . The order was a defeat for producers who had hoped that the issue had been settled when the circuit court ruled in their favor.

But they do not believe that the Supreme Court reversal is a mandate for FPC to cut initial prices or eliminate the 2 cents escalation called for each 4 years. This will no doubt be the argument made by the Public Service Commission of New York, which prosecuted the appeal, and the FPC staff, which originally proposed initial prices be cut to 17 cents.

Producers will of course contend that the circuit court was correct in holding that CATC requirements have been met.

At stake is the revenue from some two trillion cubic feet in reserves in South Louisiana and the Gulf of Mexico.

CATC case . . . The Supreme Court's reversal of the FPC ruling was parallel to similar action it took in proceedings involving sales of offshore natural gas by the CATC group (OGJ, June 29, p. 50).

The CATC group (Continental Oil Co., Atlantic Refining Co., Cities Service Production Co., and Tidewater Oil Co.) had agreed to sell gas to Tennessee Gas Transmission Co. for 21.4 cents per thousand cubic feet, plus a 1-cent Louisiana tax.

The FPC finally issued the certificate without attaching any price condition, saying that the need for the gas justified the initial price.

The Supreme Court ordered further hearings on the initial prices, saying that they must be supported by substantial evidence to establish that such prices are required by public convenience and necessity and are in the public interest.

Last week, the FPC announced that the new CATC hearings will start January 12.

The producers have been notified by the FPC "to adduce such additional evidence as they may deem necessary or appropriate to support or justify the initial prices in accordance with the opinion and judgment of the Supreme Court."

This, then, puts the burden of proof on the producers, rather than requiring the FPC to prove that the prices as originally proposed were too high.

The court's rulings in these two key cases undoubtedly will create an even greater backlog of cases at the FPC. Until now, certificate cases were generally fairly routine.

By contrast, rate cases have been largely stymied while the FPC has been searching for a workable system of determining rates. Now certificate cases apparently will be in the same slow boat.

Alaskan Lease Sale Draws Big Bids

OIL companies paid bonus bids totaling $4,021,031 for 32 tracts in the Cook Inlet and Wide Bay areas in Alaska's first offshore lease sale.

Union Oil Co. of California and Ohio Oil Co. jointly made the highest bid, a $1,001,123 offer for 2,026 acres south of the Kenai River. Only other bid for the same tract was $6,078 from Standard Oil Co. of California and Richfield Oil Corp.

Union-Ohio combine also bid $615,123 for 2,757 acres in the same area. Nearest competitor was Texaco Inc., with a bid of $227,100.

Total spent by Union-Ohio for the day was $2,542,615, all for tracts in the Cook Inlet region.

Phillips Petroleum Co. was next high total bidder with $1,043,625 laid out for 20 tracts in the Wide Bay area. The amount spent by other successful bidders was:

California Standard-Richfield $819,-619; Texaco $600,000; General Petroleum Corp.-Continental Oil Co. $143,-774; Pan American Petroleum Corp. $103,824; Shell Oil Co. $56,613. All except the Shell bidding was for acreage in Cook Inlet area.

Fracturing of Rule 37 Wells Delayed by Court

• Two rulings by Texas court cast some doubt on whether a Rule 37 well can be fractured and remain within lease lines. The law of trespass cited in the two cases may be extended to cover other fracturing jobs.

THE STATE district court decisions in far South Texas appear to have opened a small chink in the legal armor of drillers of tiny tracts in Texas.

The rulings also have sent oil-company attorneys generally running for their law books because the decisions may have much broader implication.

Both were handed down in Ninety-Third District Court in Edinburg, Hidalgo County—but by different judges.

Each prevents, temporarily at least, an independent operator from fracturing a small-tract well with the size of job conventional for the field on grounds that the treatment would create fractures across lease lines. This, both judges agreed, would constitute trespass of a continuing and damaging nature in that the effect would be to extend a well bore under another operator's lease.

The successful complainants in both cases were Delhi-Taylor Oil Corp. and Mayfair Minerals, Inc.

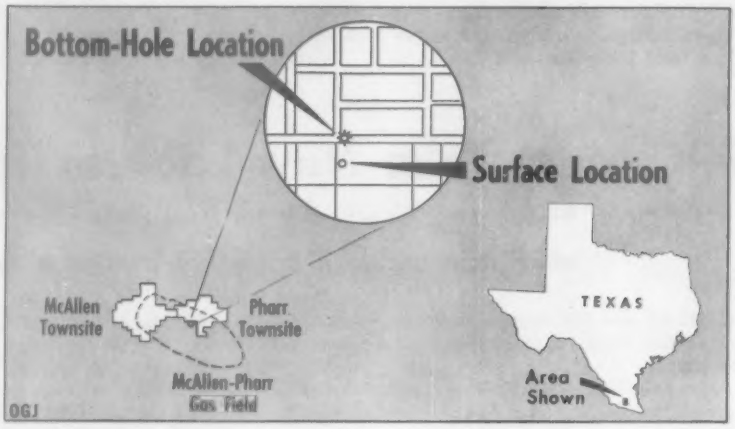
The wells involved in both cases were drilled under Rule 37 exceptions on land in the city of Pharr and completed in the Hansen sand in McAllen-Pharr gas field at about 9,500 ft.

The initial injunction was entered against Coastal Gulf Oil Co., Houston, and Kenneth Fox. Judge W. R. Blaylock affirmed Delhi-Mayfair arguments that a conventional fracture treatment in the area (20,000 gal. of fluid and 25,000 to 45,000 lb. of sand) would create fractures which would extend off the tiny lease.

Judge Blaylock rejected Coastal Gulf's argument that the Texas Railroad Commission has jurisdiction over completion of wells and should hear the issue first. The rejection was on grounds that trespass was involved and the commission does not have jurisdiction.

Case No. 2 . . . The second case, heard by Judge John Miller of Sinton, Tex., involved a well drilled by Dugger & Holmes, San Antonio, under a lease granted by the city of Pharr conveying mineral rights under the community's streets and alleys.

The San Antonio firm secured a surface easement for a drilling site overlying Delhi-Mayfair leases from a Delhi-Mayfair royalty owner and directionally drilled its 1 City of Pharr to bottom under a 30-ft.-wide street splitting the Delhi-Mayfair leases.



A DUGGER & HOLMES well in the City of Pharr, Hidalgo County, is spotlighted in latest small-tract drilling controversy in Texas. Well is slant drilled under a street. Delhi-Taylor and Mayfair Minerals own all land around the street. They claim fracturing the well will extend it beyond lease lines, which in this case is the 30-ft. wide street.

Delhi-Mayfair filed suit contending the city lease to be invalid in that it did not own the minerals under the streets and alleys. It later amended the suit to also ask for a directional survey of the well and for a temporary injunction prohibiting Dugger & Holmes from fracturing the well in such a way as to extend fractures under the Delhi-Mayfair leases.

The suit for the temporary injunction was heard early in December and the injunction granted. Again, the court accepted testimony of expert witnesses for Delhi-Mayfair that a fracture treatment conventional for McAllen-Pharr field would create fractures extending much farther than the 15 ft. to Delhi-Mayfair's lease lines.

The case principally cited by complainants during the hearings was that of Hastings Oil Co. vs. The Texas Co. in 1950. In this case, the Supreme Court of Texas affirmed that Hastings had directionally completed a well so as to cross a Texaco lease line and trespassed on Texaco property.

What it means . . . Coastal Gulf has already appealed to the Court of Civil Appeals in San Antonio to overturn the injunction. And it is expected that Dugger & Holmes will do the same.

What will it mean if the decisions stand up under appeal?

First, the rulings do not prohibit fracture treatments as such—only those which would send fractures across lease lines. There is no known way at present to say exactly how long fractures will be created by a certain size fracture job in a given zone. This will make it difficult in many cases to define whether trespass will occur.

Open to damage suits? . . . There are other facets of the Hidalgo County rulings, however, that are of concern to operators.

They open the possibility that an operator might be sued for damages due to trespass of this sort committed via past fracturing operations. The law of trespass has been on the books for years and the fact that a fracture treatment was performed before it was known to constitute trespass probably would not be an effective defense, one attorney believes.

Another possibility being mentioned is that an operator might be open for damages by his own royalty owner. This might occur where an operator held several adjacent leases not in a pooling unit. The operator may have fractured a well on one of them so as to extend the fractures across the lease line under another of his leases. It is suggested that the operator might be sued by the royalty owner of the latter lease.

What the Future Holds for Pipelining

. . . an interview with A. N. Horne

• Al Horne, a veteran of 41 years of pipelining, predicts some big changes in pipeline construction and operation. He sees a wider use of automation, more work being done on the right-of-way, and better trained men to do these jobs.

A. N. HORNE tells the Journal's pipeline editors he envisions such things as a continuous string of pipe—possibly spiral welded and ready to put in the ground—in the future for pipelining.

Q.—In your opinion, what major changes may be expected in the foreseeable future in all phases of pipelining?

A.—The one trend which overrides all others today throughout the oil industry, pipelining included, is the concerted effort to reduce costs to an irreducible minimum. Never in the industry's history has there been such a drive for efficiency and economy in order to remain competitive. The reason of course is that never before has the oil business been so competitive.

Q.—What effect, if any, will cost cutting have on the manner in which pipelines are designed, constructed, and operated?

A.—The impact certainly will be felt, already has been felt, in all branches of pipelining.

Q.—Will keen competition cause the industry to make changes that might not otherwise come about?

A.—No. More probably the result will be to intensify our efforts in the directions in which we are already going.

Q.—What form will these efforts take in construction, for example?

A.—Modern equipment has already done much to hold down construction costs per foot. Modern spreads equipped with $3 to $6 million in machinery and equipment can lay 3 to 4 miles per day of large-diameter pipe compared with one-half to three-fourths of a mile of small-diameter pipe by hand with 250 men on a gang.

Q.—What about the future—automatic welding on the right-of-way, or similar advances which are being pushed today?

A.—Going beyond even automatic welding on the right-of-way, I believe that it is possible to fabricate a continuous pipeline—not merely to automatically weld joints together—but to start with plate and strip and produce a completed line, with protective coating, which will be lowered into the ditch ready for burying.

Q.—By what means will this be done?

A.—Probably by some process such as spiral welding. The spiral-weld technique already produces continuous small-diameter tubes in the plant. And I believe that one day we will be able to accomplish the same thing with big-inch pipe on the right-of-way except where there are obstacles such as mountains and canyons. It could be done in swamp.

Q.—You mentioned coatings—if there came such a drastic change in welding, then surely we might expect similar advances in corrosion protection.

A.—We have had good coatings for years. But I have great hopes for some of the plastics, simply and economically applied, to attain still better protection without the disadvantages in application common to current standard coatings.

Q.—How would the plastics be applied?

A.—At the pipe mill, or, if right-of-way fabrication comes to pass, and the pipe mill in effect goes into the field, then they would be applied there.

Q.—Ditching remains a costly phase of construction, especially in rock. Do you see significant progress in this area?

A.—For years I have dreamed of the possibility of drastic changes in ditching. From time to time proposals are advanced for high-powered plows or rippers, which of course are practical in some instances. But I have been impressed with the fact that we frequently

Al Horne has helped build some of world's biggest lines

FEW MEN have done as much pipelining as Albert N. Horne, and few men know it so thoroughly as a builder, operator, and executive.

For Al Horne's vast acquaintance has come from 41 years of living with the industry. His first association with pipelining was in January 1919 when he joined the Doherty (Cities Service) organization. His formal separation came this month with his retirement as vice president and general manager of Texaco-Cities Service Pipe Line Co. and Kaw Pipe Line Co.

While he is officially retired, he is still an active part of the industry to which he has contributed so much during four decades. He had scarcely moved out of his office in Tulsa, before he was en route to a consulting assignment to engineer a major crude line overseas.

"This is the type of thing that I plan to do, on occasion, to keep active and involved in pipelining," Horne said.

Horne earned a B.S. degree from Mississippi State College, then Mississippi A&M, in his native state.

In January 1918 he became a lieutenant in the newly organized Army Tank Corps. He served under a captain named Dwight D. Eisenhower at Gettsburg, Pa.

The next year he joined the Doherty organization, starting a career which was spent entirely in the service of affiliates of Cities Service Co. and Texaco Inc.

He was successively laborer in a construction gang, timekeeper, field gager, district superintendent, and finally manager of Empire Pipe Line Co., where he did pioneering work in remote-control operation 30 years ago, far in advance of modern automation.

He later became vice president of Texas-Empire Pipe Line Co. (now Texaco-Cities Service) and Kaw Pipe Line Co. and a director of Texas-New Mexico Pipe Line Co.

When World War II broke out and the Big Inch and Little Big Inch lines were built from Texas to New York and Philadelphia, Al Horne was one of the key executives contributed by industry to do the job.

From July 1942 to April 1946, he was vice president and assistant general manager of War Emergency Pipe Lines, Inc., during construction of the "Inch" lines. He was general manager during operation, on loan from Cities Service.

He then returned to Texas Empire until July 1949 when The Texas Co. released him to direct construction and initial operation of Trans-Arabian Pipe Line Co. He remained until January 1951 with this 1,063-mile 30 and 31-in. project, extending from the Persian Gulf through Saudi Arabia, Jordan, Syria, and Lebanon to the Mediterranean.

From 1951 to January 1954 he was president and general manager of Trans-Northern Pipe Line Co. during design, construction, and startup of the 500-mile 8 and 10-in. products line from Montreal to Hamilton, Ont. He returned to Texaco - Cities Service, an Oklahoma-Chicago crude and products system, and Kaw Pipe Line, a crude-gathering system in Kansas, which he served as vice president, general manager, and director until his retirement.

underestimate the tremendous power required to make ditch in that manner.

Q.—What, then, do you think is the answer?

A.—My idea is, instead of drilling holes and blasting, or ripping, to have huge twin saws to cut a wedge-shaped ditch in rock. The machine which would power the saws would have some provision for lifting out the rock also.

Q.—Do you expect equally great changes in the manner of operating pipelines?

A.—We have already seen almost fantastic changes in the past 10 years; in fact, we have been feeling our way in automation for more than 30 years. In 1927-29, there was an experimental automatic station on exhibit at the oil show in Tulsa. It was sponsored by the ASME.

Afterward my company (the old Empire Pipe Line) installed a remote-controlled station between Guthrie and Cushing. I believe it was the first in the industry. It worked in every respect, except the relays were not dust proof. And so, while the major components functioned properly, we were not quite ready for remote operation.

Q.—The satellite station is the conventional type that is constructed today. Will there be other changes?

A.—We will, of course, see an increase in the applications of automatic, remote, and supervisory control. The trend will be toward simplicity in automation. In the early days, there was a tendency to telemeter too many indications to the control point. The trend will be to make machinery more fail safe and to reduce the number of functions monitored.

Computers will be developed much more advantageously than they are now. There is no question that they will find greatly increased use in pipelining. I do not refer now necessarily or exclusively to the so-called big brains; rather I envision widespread use of smaller computers which would be used in planning and operations and to control perhaps individual stations.

Q.—Intimately connected with pipeline control is communications. What changes are likely here?

A.—There is the possibility that the pipeline itself might become a communications channel to be used for supervisory control. I can also visualize, and this, more readily, closed-circuit TV. Not only would you be able to scan instrument indications at the station, but you would have a view of the pump room as well. Thus you would have informtaion on the condition of the station that no telemetering system could give you.

Q.—What will the station of the future be like?

A.—Future stations will be powered more and more by by combustion-gas turbines and free-piston engines where electric power is not available economically. Unquestionably the turbine is the answer for the desert type of pipelining.

Beyond this, there is a possibility for a simple in-line pump which would almost eliminate aboveground

station facilities. And closer station spacing seems desirable as a means of achieving greater throughput through the same size of pipe. Each unit could operate at near optimum pressure, and the close spacing would prevent the great pressure drop which now occurs. Power cost would be the determining factor. There would be a saving in avoiding going to the highest pressure.

Q.—What changes do you expect in the type of products handled by pipelines?

A.—Our own Texaco-Cities Service system is an example of what can be done in transporting a variety of products. We move natural gasoline, crude oil, butane, propane, and heating oils in our system from Oklahoma and Kansas to Chicago. And we have also proved the feasibility of handling residuum as well, by blending with crude and natural gasoline.

Q.—Is it feasible, now or in the future, to batch nonpetroleum liquids in petroleum lines?

A.—It is physically possible. Whether it is actually done depends on whether it is economically logical.

Q.—Do you consider petrochemicals to be logical candidates for pipeline shipment, either in batches in products lines or in exclusively petrochemical lines?

A.—Petrochemical pipelining should be a big field in the future. The surface has not been scratched in the petrochemical industry. I'm convinced that its importance to the petroleum industry will be increasing for many years to come. And along with that growth will be a related growth in the pipelining of petrochemicals.

Q.—Internal coating of pipe is becoming the established practice for natural-gas lines to increase efficiency and reduce corrosion and maintenance. Do you expect oil pipelines to follow suit?

A.—Yes. I think it will follow as a matter of course. It will solve certain corrosion problems which thus far have defied inhibition and other means of control.

Q.—Pipelining has numerous special problems which raise costs, and so their solution might offer opportunities for cutting costs. What are some of these?

A.—Most significant, perhaps, is the problem of transporting heavy crude oils which we have in tremendous quantities in many parts of the world and which may became an important part of our supply.

We have tried many methods—viscosity breaking, blending with a lighter hydrocarbon, mixing with water, maintaining a water boundary against the pipe wall, and simply the installation of a larger-diameter line to provide capacity. One of the best possibilities, in my opinion, would be a simple hydrocarbon cut that would greatly reduce the viscosity of the crude.

Q.—How do you propose to reduce paraffin deposition?

A.—Much work is already being done by injecting chemicals in tanks to reduce tank-bottom buildup, and, before that, in wells themselves to hold paraffin in suspension during its trip through the pipeline. I expect this practice to become more widespread.

Q.—What phases of construction come under the "special problem" category?

A.—Construction in congested areas has become extremely costly, and therefore has become highly desirable to avoid where possible. One means would be to locate refineries outside congested areas.

Q.—We've said nothing yet of people—the men who run the pipelines. Will they change with pipelining?

A.—The type of man who operates a pipeline has been changing since the rational design of pipelines began some 30 years ago. The change has been particularly rapid during the past 10 years as automation has become a factor.

Q.—Will the pipeliner completely disappear when automation becomes highly developed?

A.—The trend has been for fewer and fewer men to do a bigger and bigger job of moving petroleum by pipeline. This has been the result of the influence of larger diameters and remote operation. The trend will no doubt continue for the time being, but tomorrow's pipelines will still need plenty of men.

Technical and semitechnical people are taking over. The day of the operating man who grew up on the pipeline has passed. Highly trained men will continue to be needed, even though individual stations or whole systems will one day be run by computer.

Hugoton Gas Battle Lands in Kansas Court

- Northern Natural claims ratable take order abrogates its contracts. Earlier, the commission accuses Oklahoma of draining off gas.

PRODUCTION battle in Kansas Hugoton gas field has broken out on a new front after subsiding early in December when the state corporation commission softened its production requirements.

Northern Natural Gas Co., Omaha, has filed suit in district court in Finney County asking for a review of a commission order. The commission had ordered Northern to take gas ratably from all wells to which it is connected in the Hugoton field.

Northern Vice President John M. Hanley declared his company is not challenging the commission's ratable-take concept but is questioning the agency's right to abridge contracts.

Hanley explained the commission order stems from a gas-purchase contract between Northern and Republic Natural Gas Co. entered into in 1930. The Republic contract was the first of Northern's many agreements in the field and prescribed certain minimum volumes to be run each year.

The rest of Northern's contracts in the field, by agreement with the well owners, provide for ratable taking among all wells except wells under the Republic contract. The wells are exempt until the minimum volume is run for Republic.

Northern contends that since owners of all wells have agreed on different practice of buying gas, the commission order is an infringement of private contracts.

Hanley said "we question the commission's right to abridge private contracts between Northern and the well owners."

He added his company felt the matter should be reviewed by the courts since the order cast doubts on the obligations set forth in the contracts.

The commission, however, declared the contracts do not necessarily bear any relationship to the market demand for gas from the Kansas-Hugoton field or any gas field.

New angle . . . The Northern suit introduced a new angle to the state vs. purchaser tug of war that started in 1949, when the commission first pegged Hugoton prices.

Earlier this month, the commission openly charged for the first time that the Kansas part of the tristate Hugoton field is being drained by high production rates in Oklahoma.

During a 3-year fight to increase Kansas production in Hugoton field, the commission never before openly accused Oklahoma of draining gas from Kansas. It merely recognized the possibility and said the trend was inevitable.

Commission members, however, now have accepted the drainage arguments of Southwestern Kansas Royalty Owners Association and its star witness, Dr. Charles F. Weinaug, head of the petroleum engineering department of the University of Kansas.

Weinaug testified before the commission that he estimated annual drainage at from 2 to 8 billion cubic feet. He said adjacent Oklahoma wells are being produced twice as fast as those in Kansas.

The professor also contended that in addition to a loss of ultimate reserves, many Kansas wells must be redrilled because of casing corrosion.

The commission declared that Weinaug's testimony was substantiated by other evidence. Members concluded that pressure differentials between wells in Kansas and Oklahoma are increasing and that "drainage is occurring from Kansas into Oklahoma."

Allowables . . . The commission, however, set a modest 6-month allowable of 281,000,000 M.c.f.

This was only slightly higher than purchasers' nominations of 277,801,541 M.c.f.

In marked contrast, previous allowables always have been much higher than nominations in a commission policy of trying to force purchasers to take more Kansas gas. This policy only resulted in underages piling up to their present total of 135,000,000 M.c.f.

The commission had planned to spread out the underages over the entire field. Thus, producers who had a market for gas could step up their production. Those who didn't would lose reserves by the amounts they failed to meet the allowables.

Commission authority to do this was successfully challenged in district court, and an appeal is now pending before the Kansas Supreme Court. The commission's authority, meanwhile, has been bolstered by legislation giving it the right to consider broad, interstate production and marketing questions.

watching WASHINGTON

Clyde La Motte

- Which newcomers should get quotas? . . .

OIL IMPORT Administration officials may have opened a Pandora's Box for themselves when they agreed to a plan to make room for new product importers.

The problem of the Oil Import Appeals Board is this: It will have to consider each request on a case-by-case basis and decide whether a quota is justified.

Obviously, if it opens the door too wide, the accompanying rise in product imports would surely create squawks of protest. But if it is too tough, granting only a few new quotas, there would be even louder outcries from applicants who had been rejected.

Up until now, the OIAB has had relatively few headaches. It was following hard and fast rules to which almost no exceptions were possible. But now that has been changed as far as product imports are concerned. It will have to exercise judgment rather than simply applying clear-cut

Roosevelt to Keep Pressure on Marketers

• He wants to hold new hearings on "coercion," and the odds are he'll seek a law preventing any oil company interest in sales of specific TBA brands.

REP. James Roosevelt (D.-Calif.) appears determined to press his investigation of the alleged use of coercion in TBA marketing by major oil companies.

The next likely steps are these:

. . . **Another hearing,** at which major company representatives would be called on to testify.

. . . **A bill,** or bills, aimed at preventing any future coercive action.

No date for further hearings has been set, but it likely will be early next year.

Roosevelt said last week that he is not ready to discuss precisely what type of legislation he may seek.

However, he appears to be leaning toward a bill which would bar a major oil firm having any interest—direct or indirect—in the sale of a particular brand of tires, batteries, or accessories to service stations leased by the company to an independent operator.

He introduced a bill of this nature, together with several others affecting marketing, during the past session of Congress. No action was taken on them.

It seems probable that he will choose to seek legislation aimed only at TBA marketing rather than to undertake the larger task of pressing for a bill which would divorce major oil companies from all marketing.

The tip that major company men will be called before the subcommittee came during the recent 3-day hearing of complaints from wholesalers and retailers.

Each time a witness cited examples of coercive acts, Roosevelt asked him to submit to the subcommittee "in confidence" the name of the company representative, together with other specific data.

Roosevelt said later that the names submitted are being checked and that some of the people named will undoubtedly be called before the subcommittee if and when hearings are resumed.

He said that as a result of the hearings thus far "a strong case has been developed to show that coercion does exist."

Not cleaned up . . . Much of the testimony at the recent hearing was to the effect that major oil companies often force their leased-station dealers to sell exclusively—or almost exclusively — TBA merchandise "recommended" to them by the major.

The net result, they said, is that independent TBA wholesalers are being forced out of business and that the independent service-station operator isn't being given a freedom of choice.

Roosevelt conceded that much of the information was virtually the same as that presented to the committee during hearings 2 years ago.

"The thing is," he said, "at that time we gave the major companies a year in which to clean up such practices. From the evidence we got this time, it seems that they didn't do the cleaning up."

He said major-company management must be aware that coercive practices are being used by salesmen.

"Therefore, the companies must go further than simply giving lip service" to a policy stating that lessees are free to choose TBA items.

A stir was created in the hearing by a sound film of a conversation between a station lessee and a company representative, who was making it plain that if the operator wanted his lease renewed he must handle the company's TBA line.

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rules. And any time the use of judgment is involved, there will be someone questioning that judgment.

The OIA knew this before it proposed the rule change. But it felt that the Government was in an untenable position in restricting for any extended period product imports to those companies with a product-importing history.

It tried to come up with some relatively simple solution, as was possible in crude-oil imports by tying those to refinery runs. When no such solution was found, the OIA was faced with the painful process of a case-by-case approach.

Hearings will be held on the requests of the would-be product importers during the next 6 months. However, any quotas granted will not become effective until the following allocation period.

That will at least give OIA an opportunity to fit the newcomer quotas into the over-all product import totals. Even so, the task of the OIAB is likely to be a ticklish one.

• A more favorable view on depletion . . .

THE DANGER of any adverse action on percentage depletion by the House Ways and Means Committee appears to be diminishing.

Rep. Wilbur Mills (D.-Ark.), who had caused some oil-industry concern with an article in a national magazine last month, seems satisfied now that present rules are fair and adequate.

He did raise some questions during the panel discussion on percentage depletion about its application to oil firms operating abroad. Also, he indicated that he felt there was some danger that percentage depletion was being extended beyond its original scope and the intent of Congress.

He told a reporter last week, however, that he is convinced percentage depletion is necessary for the oil and gas industry.

He was not as positive about its use abroad, but indicated that it isn't likely the provision will be changed in the near future, certainly not in 1960.

Of course Mills could be overruled by his committee. However, from the tone of questioning by committee members during the panel discussion on percentage depletion, one would guess that this is not likely.

Any remaining danger, therefore, lies in the Senate. Some of the sharpest criticism of percentage depletion has come from that floor. And an issue may be made of it there during the coming session, particularly by those who oppose Sen. Lyndon Johnson and figure to embarrass the Texan.

Some qualified observers fear that the real, long-range danger lies in the fact that Congress is going to be under continuing and increasing pressures to raise more tax revenues while reducing tax rates at the same time. Caught in such a corner, Congress might succumb to the temptation to take away some tax "advantages" that apply to only a relatively few taxpayers in order to hike tax revenues without a general tax increase.

Coal Wants Import Quotas Reviewed in

THE COAL industry loosed an expected blast last week at the increased residual-fuel-oil imports which will be permitted during the first 6 months of 1960.

And the Independent Petroleum Association of America, although not openly critical, indicates that it is not very happy about the government action. However, it plans no immediate protest.

The District 1-4 quotas for residual fuel oil for January 1 to June 30 have been set initially at 425,000 bbl. daily, an increase of 62,000 bbl. daily over actual quotas for the current allocation period (OGJ, Dec. 14, p. 43).

There was little reaction to the program other than on the residual-fuel-oil allocations.

The coal interests had fought hard against any increase, going all the way to the White House with their protests when they learned that an increase was being planned.

And they aren't going to quit fighting yet, even though the administration ruled that an increase was necessary to protect against possible fuel-oil shortages along the East Coast during the winter months.

"We are shocked by this action and plan immediately to ask the Department of Interior for a review and a downward adjustment of quotas in line with the facts," Joseph Moody, president of the coal conference, said shortly after the Government's action was made public.

Moody's argument against any increase is based on these three points:

...**No need** has been proved to justify an increase. Instead, actual imports of residual fuel have not kept up with quotas thus far in the life of the mandatory-control program.

..."**Depressed" prices** of residual ("close to the lowest levels for the past 11 years") indicate there is an ample supply now available. Otherwise, prices would go up.

...**High stocks** now on hand are "further evidence of the lagging demand for residual oil."

Company import quotas for first half of 1960

Crude, Unfinished Oils

Barrels per day, Jan. 1-June 30
Districts 1-4

Importer	Old Quota	New Quota
Advance Refining	255	321
Allby Asphalt	230	292
Allied Materials	245	301
American Petrofina	3,920	4,497
Anderson-Prichard	3,090	3,502
Ashland	10,870	13,275
Atlantic Refining	38,000	38,000
Atlas Processing	....	363
Bayou State Oil	80	93
Bell Oil & Gas	1,980	2,174
Berry Asphalt	325	358
Berry Refining	645	735
Big West Oil	240	290
Bryson Pipeline	....	80
Cactus Petroleum	240	309
Calumet Refining	210	233
Century Refining	240	316
Champlin	2,690	3,189
Cities Service	21,040	21,040
Clark Oil & Refining	3,180	3,649
Colorado Oil & Gas	....	2,094
Continental	13,350	15,436
Cooperative Refinery	3,610	4,109
Cosden	3,880	4,530
Cracker Asphalt	140	141
Henry H. Cross Co.	345	403
Crown Central	3,600	4,027
Danaho Refining	380	380
Delhi-Taylor Oil Corp.	3,010	3,616
Delhi-Taylor—Mayfair Minerals	705	1,070
Dow Chemical	....	2,040
Eddy Refining	225	264
Elk Refining	470	552
El Paso Natural Gas	1,560	2,157
Empire Petroleum	460	590
Empire State	360	409
Evangeline Refining	160	175
Famariss	160	184
Farmers Union	1,870	2,229
Frontier Refining	2,070	2,455
Gabriel	1,895	1,895
Gladieux	55	74
Great Western	175	227
Gulf Oil Corp.	71,990	71,990
Hess, Inc.	7,420	7,420
Howell Refining	425	507
Hunt Oil Co.	....	762
Husky	630	778
Ida Gasoline	20	26
Illinois Farm Supply	490	595
Indiana Farm Bureau	1,340	1,565
Ingram	2,650	2,650
S. D. Jarvis Co.	150	173
Jet Fuel Refinery	40	58
Kendall Refining	465	540
Kerr-McGee	4,050	4,794
Laketon Asphalt	240	339
Leonard Refineries	2,660	3,058
Macmillan	380	470
Marvel Refining	150	121
Metropolitan Pet.	1,310	915
Mid-America Refining	240	291
Midland Cooperatives	1,330	1,598
Monarch Refining	250	279
Monsanto Chemical	3,000	3,491
Murphy Corp.	3,260	3,260
Naph-Sol Refining	605	777
National Cooperative	2,760	3,266
Northwestern Refining	8,710	8,710
Ohio Oil	4,150	10,229
Oriental Refining	400	469
Osceola Refining	220	225
Pennsylvania Refining	130	152
Petroleum Refining	230	234
Petroleum Specialties	720	926
Phillips Petroleum	15,960	18,682
Plymouth Oil	3,240	3,915
Pontiac Refining	5,250	6,364
Pure Oil Co.	12,900	14,762
Quaker State	960	1,100
R. J. Oil & Ref.	380	429
Rado Refining	35	46
Rock Island	1,550	1,748
Seminole Asphalt	190	225
Shamrock Oil & Gas	2,160	2,590
Shell Companies	21,570	25,132
Signal*	*11,810	11,810
Sinclair	40,120	40,120
Sioux Oil Company	455	576
Skelly	4,800	5,380
Socony Mobil	43,300	43,300
Sonneborn Sons	135	154
South Penn	1,090	1,247
Southland Co.	2,270	2,270
Southwestern Oil	3,600	3,842
Standard of Calif.	43,070	43,070
Standard of Indiana	32,410	35,120
Standard of N. J.	46,480	46,499
Standard of Ohio	10,790	12,707
Sun Oil Co.	32,550	32,550
Sunray Mid-Continent	9,170	13,826
Sure-Seal Corp.	45	52
Tennessee Gas	3,340	3,932
Texaco	35,120	35,120
Texas Asphalt	1,515	1,515
Texas City Refining	3,030	3,642
Texas Eastern	....	1,975
Texas Gas Corp.	630	806
Texstar Corp.	....	216
Three Rivers	105	125
Tidewater	22,100	22,100
Uinta Oil Refining	135	156
Union of Calif.	375	426
United Refining	2,270	2,270
Vickers Petroleum	1,520	1,716
Vulcan Asphalt	25	210
Warrior Asphalt	135	138
Waskom Natural Gas	70	122
Western Natural Gas	....	1,692
Western States Ref.	520	560
Westland Oil	165	215
Wickett Refining	290	328
Wolf's Head	200	247
Wyandotte Chemicals	245	308
TOTAL	681,820	718,087

*Formerly Eastern States quota.

Hopes of Cutting Resid

Moody's conclusion is that the effect of the Government's action is to expand the residual-oil market at the expense of coal.

He said the 1957 level of residual imports, if maintained, would displace 30 million tons of coal, and that with the new residual quotas just announced "coal displacement shoots up to more than 37 million tons."

IPAA's view . . . As voiced by Russell Brown in a report letter to IPAA members, the IPAA's position is more one of cautious watching than of outright criticism.

"It should be noted that prices for residual fuel oil have been at depressed levels for the past 2 years," Brown wrote.

"There has not been, nor is there any indication now, of any shortage of residual fuel oil."

Brown said that while the increase in residual-fuel imports is not expected to have any significant effect on the level of U. S. crude-oil production, "these increased imports could prevent a needed recovery in the depressed prices for this product and thereby continue to depress the refiners' total realization from each barrel of crude oil."

As an alternative to residual-fuel-oil allocations, IPAA has suggested that each importer having an allocation for crude oil be given the option to import residual fuel and charge it against his crude-oil allocation.

"The supply responsibility would then clearly be with the importing companies and not a matter of government determination," Brown said.

The Government's view . . . It is clear that the Government wants to keep allocations at a high enough level to assure an adequate supply of residual and to prevent heavy pressures for a price hike.

Interior plans to keep the supply-demand situation "under surveillance," Interior Secretary Fred Seaton said in a statement released at the time the new quotas were announced.

"If circumstances warrant," he said, "appropriate adjustments will be made."

CRUDE QUOTAS CON'T

District 5

Importer	Old Quota	New Quota
Caminol Co.	2,200	2,114
Century Oil	1,290	1,326
Douglas Oil	6,050	5,678
Edgington Oil Ref.	2,760	2,604
Envoy Petroleum	1,000	906
Fletcher Oil	4,200	3,926
Golden Bear	1,220	1,252
Golden Eagle	2,400	2,249
Macmillan Petroleum	2,350	1,940
Manespo Refining	1,100	1,057
Mohawk Petroleum	3,290	3,064
Newhall Refining	690	691
Palomar	400	378
Powerine	3,930	3,852
Richfield	21,350	21,282
Shell Companies	24,300	22,952
Signal	3,200	4,757
Socal Oil & Refining	940	811
Socony Mobil	19,930	18,045
Standard of Calif.	37,260	35,291
Sunland Refining	1,800	1,737
Texaco	15,400	14,572
Tidewater	28,400	26,803
U. S. Oil & Refining	6,000	5,663
Union of Calif.	25,320	24,310
Wilshire	13,600	12,835
TOTAL	232,920	220,095

Puerto Rico

Importer	Old Quota	New Quota
Caribbean Refining	18,203	18,203
Commonwealth	61,944	61,944
Gonzales Chemical	736	736
TOTAL	80,883	80,883

Residual Oil

Barrels per day, Jan. 1-June 30

Districts 1-4

Importer	Old Quota	New Quota
Ashland	165	193
Atlantic	288	337
Ballard Oil	3,110	3,637
Belcher Oil	1,675	1,959
Buckley Bros.	4,506	5,269
Canadian National Railways	21	25
Central Petroleum	3,261	3,813
Colonial	3,970	4,642
Copeland Terminals	.....	16
Gulf Oil Corp.	2,141	2,504
George Hall Corp.	377	441
Hess, Inc.	41,275	48,265
Inland Terminal	15	17
George T. Kaneb	28	33
Metropolitan Pet.	22,541	26,359
Military Petroleum Supply Agency	1,458	1,704
New England Pet.	9,037	10,567
Pure Oil Co.	427	499
Royal Petroleum	4,226	3,112
Shell Companies	17,742	21,618
Signal	.....	8,818
Sinclair	303	354
Socony Mobil	269	315
C. H. Sprague & Son	22,798	26,660
Standard of Calif.	674	788
Standard of Indiana	22,990	26,883
Standard of Kentucky	11,733	13,720
Standard of N. J.	110,494	129,208
Steuart Petroleum	4,135	4,836
Texaco†	58,606	68,532
Whale Oil Co.	319	373
White Fuel Corp.	8,126	9,503
TOTAL	364,995	425,000

†Old quota includes quota of Paragon Oil Co., which Texaco recently acquired.

Puerto Rico

Importer	Old Quota	New Quota
Military Petroleum Supply Agency	516	516
Porto Rico Iron Works	1,074	1,074
Standard of N. J.	550	550
TOTAL	2,140	2,140

Finished Products

Barrels per day, Jan. 1-June 30

Districts 1-4

Importer	Old Quota	New Quota
Ballard Oil	1,165	1,165
Blanchet & Fils	3	3
Castrol Oils	.....	2
Gulf Oil Corp.	2,723	2,723
Hess, Inc.	3,234	3,234
Otto Leonhardt	.20	.20
Metropolitan Pet.	5,100	5,100
Military Petroleum Supply Agency	30,554	30,554
Pure Oil Co.	5.50	5.50
Robinson Lumber Co.	1.25	1.25
Royal Petroleum	1,476	1,476
Socony Mobil	25	25
Standard of Calif.	7,284	7,284
Standard of N. J.	13,590	13,590
Shell Companies	9,789	9,812
Sun Oil Co.	604	604
Texaco‡	1,052	1,052
TOTAL	76,631	76,631

‡Old quota was held by Paragon.

District 5

Importer	Old Quota	New Quota
Alaska Propane	35	35
Calor Gas Co.	2.10	2.10
Fairbanks Plumbing	3.33	3.33
Military Petroleum Supply Agency	3,876	3,876
Shell Companies	185	193
Standard of Calif.	576	576
Time Oil Co.	2,068	2,068
TOTAL	6,752	6,753

Puerto Rico

Importer	Old Quota	New Quota
Military Petroleum Supply Agency	152	152
Shell Companies	57	57
Standard of N. J.	104	104
Tropical Gas Co.	41	41
TOTAL	354	354

Diesel Engine

ADVANTAGES:

- Cuts fuel costs
- Low maintenance costs
- Overhauls less frequent

DISADVANTAGES:

- Operation less peppy
- Higher initial cost
- Heavier than gasoline engine
- Greater noise and vibration

FOUR-CYLINDER 192-cu. in. diesel engine in experimental taxi in New York.

Diesels Are Trying for Passenger-Car

• Economy is selling point for diesels, but they still have a long way to go to come up to performance of gasoline engines.

DIESEL-powered passenger cars—being tested but still short of making the grade in the U. S.—are gaining a little ground overseas.

The diesels, which have won limited acceptance in Europe, are getting another slight push with announcement of plans by an English car manufacturer and a Japanese car maker to build diesel passenger cars.

The English development is by Standard-Triumph. Standard's Ensign is now available with a 1.6-liter "baby" diesel.

The "baby" diesel is the compact and versatile F. Perkins, Ltd., Four 99. It develops 43 b.hp. at 4,000 r.p.m. The manufacturer claims it will get about 50 miles per gallon.

Toyota Co., the Japanese manufacturer, will build that country's first diesel passenger car. It will be equipped with a 40-hp. diesel engine. This engine, according to its manufacturer, will save 50% in fuel over a comparable gasoline engine.

U. S. picture . . . Diesel passenger cars still are in the testing stage in the U. S., being tried out as taxis on the East and West Coasts.

Dodge Division of Chrysler Corp. equipped a number of taxis with the Perkins P-4 diesel, a considerably bigger companion of the Four 99. These cabs are being tested in New York, Detroit, Atlanta, and Los Angeles. Fleet owners report that fuel costs are cut from one-half to two-thirds, with additional savings in maintenance.

It adds up to impressive evidence for the economy of the diesel. But, while important, economy is not the whole picture. Performance is a factor of consequence and, in this respect, the diesel still doesn't measure up to the gasoline engine.

Dodge reports, for example, that "the noise and vibration are greater than in gasoline engines and the operation is far less 'peppy'."

The diesel engine is also heavier than the gasoline engine. Dodge installed heavier torsion bars to compensate for this greater weight in its experimental taxis.

Using the Perkins P-4 adds about $800 to the cost, including installation. This puts the breakeven point for taxi operators in New York at 75,000 miles. That's about 9 months' operation.

Offsetting this is the claim that the diesel will outlast two bodies, will easily go 400,000 miles, and will go 100,000 miles before it needs a valve job.

Future Motors, of Long Island City, N. Y., probably has had more experience with diesels than any other fleet operator. It has 12 taxis equipped with the 192-cu.-in. P.-4. The first of these was put in operation in the spring of this year, so the company has had about 9 months' experience.

Future Motors' diesels are mounted in Plymouth bodies. No. 2 diesel fuel is used, and the company reports that it costs, generally, about the same as regular gasoline.

The company says the big advantage is in less fuel consumption. Future Motors finds that diesel-powered cabs in New York get 22 to 25 miles per gallon, against 11 to 12 miles per gallon for comparable gasoline-engine taxis.

Another highly attractive feature, it finds, is low maintenance costs. Overhauls on diesels are much less frequent, less costly, and less complicated.

Drivers' views . . . While a clear advantage in costs rests with the diesel, taxi drivers are sharply divided on its merits.

Owner-drivers strongly favor the diesel because of its fuel economy. Fuel is the owner-driver's major cost item, and the approximately 50% lower fuel costs of the diesel make it highly attractive to him.

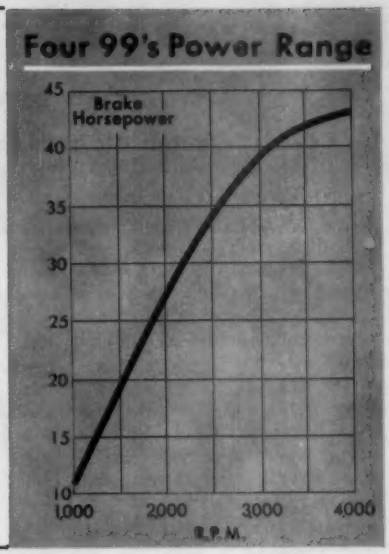
Fleet-drivers oppose the diesel. They find it is noisier, has more vibration and less pickup or getaway than a gasoline-engine cab. Since cost is not their concern, they greatly prefer to drive cabs with gasoline engines.

European picture . . . The diesel has

Diesel vs. Gasoline Engine

(Figures on diesel consumption based on test vehicles powered by Perkins Four 99 diesel engine.)

	Average Speed, m.p.h.	Gasoline, Miles per gal.	Diesel, Miles per gal.	Diesel Margin— Miles per gal.	Diesel Margin— %
Consul Mark II	30	32.3	53.7	21.4	66.3
Consul Mark II	35	29.1	48	18.9	64.9
Consul Mark II	40	27	37	10	36.7
Vauxhall Wyvern	35	33.4	49.5	16.1	48.2
Vauxhall Wyvern	40	29.5	42	12.5	42.4
Vauxhall Velox	35	28.6	54	25.4	88.9
Vauxhall Velox	40	25.1	46	20.9	83.3
Austin Omnivan	30	28.8	37.5	8.7	30.2
Bedford C.A. van	30	31	46	15	48.4
Bedford C. A. van (door to door service)		14	38	24	171.4
Beardmore Mark VII cab. (city taxi service)		16	33	17	106.2



Market

won some acceptance in Europe. Many European taxis are diesel-powered, but only one manufacturer, Mercedes-Benz, has made a standard diesel car.

The high cost of gasoline in Europe has encouraged the use of the diesel. Despite this, their use has been limited. Many manufacturers, at one time or another, have given them a whirl. These include Fiat in Italy, Austin, Vauxhall, Standard, and Ford in England, and Bugatti in France.

Several use the Four 99, which has been tested thoroughly. It is, or has been, available in such cars as the Ford Consul, the Vauxhall Velox and Wyvern, the Bedford van, and the Austin Omnivan.

This four-cylinder engine has a 3-in. bore, 3.5-in. stroke, and a displacement of 99 cu. in. Its maximum rating is 42 b.hp. at 3,600 r.p.m. or 43 b.hp. at 4,000 r.p.m. Its weight, with electrical starting equipment, is 361 lb.

A Vauxhall Velox, equipped with a Four 99 engine, averaged 56.6 miles per gallon at an average speed of 34.8 m.p.h. A Ford Consul, with the same engine, did 50.8 miles per gallon at an average speed of 24.7 m.p.h. A top speed of more than 80 m.p.h. was reached by some of the test cars.

This testing has not been limited to passenger vehicles. A Bedford van, with a 1,680-lb. load, completed 101,-202 miles on a high-speed track of a testing ground. Its average speed was 56 m.p.h. and its fuel consumption, 37 miles per gallon.

Perkins, one of England's leading diesel manufacturers, makes it easy for owners to convert to diesels from gasoline. The company offers special conversion engine sets to replace existing gasoline units in the Ford Consul, Vauxhall Velox, and Wyvern, the 55/56 Bedford 1,344-lb. van, the Austin Omnivan, and the Morris J2 van.

Thus, the diesel has had plenty of push behind it as a power plant for passenger cars. It's very economical, and that advantage is well recognized. But, until it comes closer to gasoline-engine performance, the diesel is still an also-ran.

New Gulf Frac Technique Jumps Oil Output

A NEW wrinkle has been added to hydraulic fracturing by Gulf Oil Corp.

And, says Gulf, the new approach can increase the production rate of an oil well tenfold, and sometimes even more.

In a regular fracturing treatment, large volumes of fluid are pumped into a well under pressure to crack the rock. The cracks allow a freer flow of oil into the well bore.

Gulf says it has improved the process by:

... **Finding a way** to crack the formation at the point where engineers say it will best stimulate production. It can make either a horizontal or a vertical fracture.

... **Increasing** flow capacity of the fractures by developing a method of selecting the best propping agent and the best type and amount of fracturing fluid.

Gulf says it can fracture the formation where it wants to by notching it.

It has developed two new tools which will make wedge-shaped cuts in the wall of a well.

When fluid is pumped down the hole, the pressure is directed into the notches and the formation splits along a plane indicated by the tips of the wedges.

One tool is mechanical, rotating inside the well bore as its blades cut through the cemented casing and into the formation. The other uses a high-pressure jet of liquid containing abrasives. It can cut either a horizontal or vertical notch.

The mechanical tool has been used at depths down to 8,300 ft. The jet has been used as deep as 13,000 ft.

Gulf says the new technique is applicable to all wells subject to conventional fracturing.

The new tools have been used in more than 25 wells. In one area where normal fracturing produced 25 to 30 bbl. a day, the new method produced 600 to 1,500 bbl. daily, Gulf said. Where other fractured wells were producing 2 to 8 bbl. daily, the new technique kicked up flow rates to about 35 bbl. a day.

California's First Big Offshore Flood Begun

• Monterey says it will inject water to replace the oil it produces on its island off Seal Beach as a "protective" measure to prevent any subsidence.

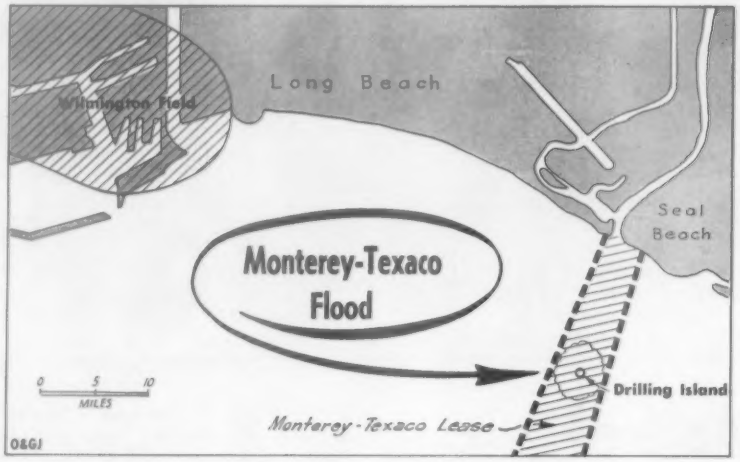
CALIFORNIA'S first major water-injection program off its coast was well under way last week.

Water from a 160-ft. source well is being injected into the upper producing zone under the Monterey-Texaco drilling island 1½ miles off Seal Beach.

The producing area, Belmont Offshore field, is on the same structure as Wilmington field, 4 miles to the north, where a million - barrel - daily flood is now being developed to halt damaging subsidence.

Monterey President E. E. Pyles said that while there has been no subsidence at the drilling island, where 30 wells have been completed, "the importance of water - flood pressure maintenance in the entire Long Beach area" prompted Monterey and Texaco to embark on the program.

The upper zone, which is receiving the injection water, corresponds to the Ranger zone in Wilmington. Monterey has no plans now to inject water into the lower zone at Belmont, which corresponds to Wilmington's Ford zone.



Pyles said Monterey and Texaco have spent $435,000 on the pressure-maintenance project. The program was voluntary, since Belmont Offshore field was excluded from the 1958 mandatory unitization and repressuring order affecting Wilmington field.

PIPELINE BRIEFS . . .

A 40-mile 12-in. line between Eastland and Callahan counties, Texas, is planned by Lone Star Gas Co. Company crews will construct the line, which will be finished May 1, 1960.

Petrobras, S. A., the government company in Brazil, plans a 35-mile 12-in. crude line from Buracica to Candeia. Contract has been awarded to Techint, Inc.

Some 180 miles of construction is planned in 1960 by Arkansas Louisiana Gas Co. A 125-mile 18-in. line will be laid from Perla to Helena, Ark. In addition the company plans 26 miles of 6-in., 26 miles of 4-in., and 5 miles of 3-in.

Gathering and trunk lines totaling 188 miles are planned by Pacific Northwest Pipeline for 1960. Projects include 18 miles of 20-in. and 40 miles of 16-in. from the main line near Camas, Wash., to Salem, Ore.; 60 miles of 12-in. from Salem to Eugene, Ore.; 61 miles of 4, 6, and 8-in. in Big Piney field, Wyoming; and 9 miles of 12-in. in Red Wash field, Uintah County, Utah.

The final phase of a 3-year construction program is being completed this month by Southern Natural Gas Co., boosting capacity from 990,000 M.c.f. daily to 1,365,000 M.c.f. daily. Construction projects now completed or in the final stages amount to 364 miles of line and 8,500 hp. in compressor capacity in Louisiana, Mississippi, Alabama, and Georgia.

Expansion at two pumping stations is under way on Sun-Canadian Pipe Line Co.'s Sarnia-Toronto products line. Jolly & White, the contractor, is installing 850 hp. at Kerwood, Ont., and 650 hp. at Paris, Ont., to be finished by March 1, 1960.

A 1,500-hp. addition to the Joy, Tex,. station of Sinclair Pipe Line Co. was completed last week. Foor Engineering Corp., Oklahoma City, has the contract and also is installing 2,750 hp. at Files and Willis, Tex., stations on the crude line. Completion is planned for March 15, 1960.

An 800-mile construction program for 1959 is being completed by Northern Natural Gas Co., and another major program is planned for 1960. The company also installed 30,900 hp. in compression this year.

Also for Pipeliners . . .

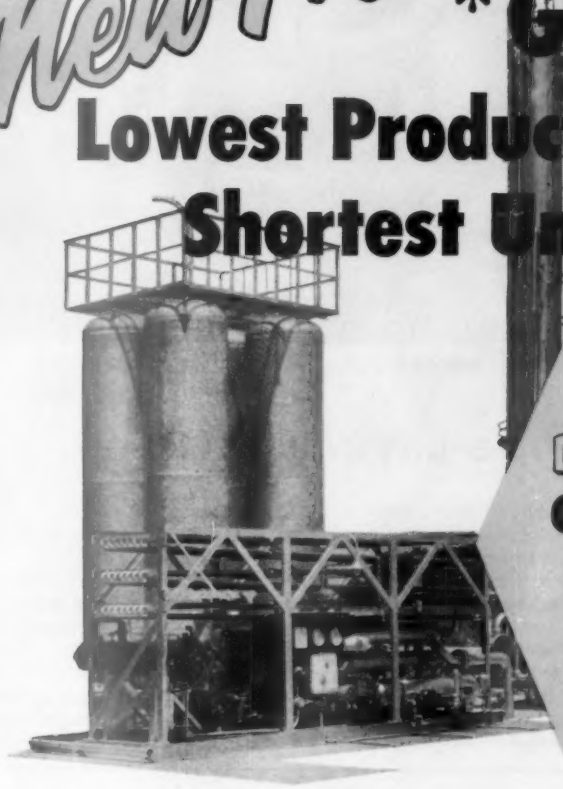
IN THE NEWS: Supreme Court tosses Transco case back into laps of FPC to decide if prices are justified in light of earlier CATC ruling (p. 47) . . . Al Horne, in an interview, discusses what the future holds for pipelining (p. 49) . . . Alcoa develops new pipe-laying machine (p. 60).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are carried in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: New roller compacts ditch backfilling (p. 84) . . . Portable bender saves money (p. 85).

New Process* GUARANTEES

Lowest Product Recovery Cost
Shortest Unit Payout Time



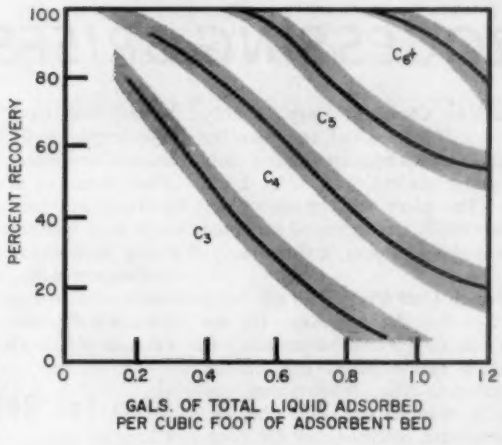
The Adsorption Process

DELTA DRYEX GASOLINE PLANT

The most economical commercial gasoline, butane and propane recovery process ever designed.

* Delta quotes a turnkey onstream installation with guaranteed recoveries.

- **A new concept for natural gasoline, butane and propane recovery.**
- **Recovers *both* natural gasoline and NGAA specification butane and propane.**
- **You get more product at a much lower cost (half in many cases) than any other commercial process.**
- **You are assured of shortest unit payout time.**
- **Dryex adsorption gasoline plants are complete including fractionation and refrigeration equipment which yield NGAA specification products.**



Dryex gasoline plants open a new realm of profit possibilities. Even those gas streams considered for other processes in the past and eliminated as economically impractical should be reviewed for a Dryex gasoline plant application.

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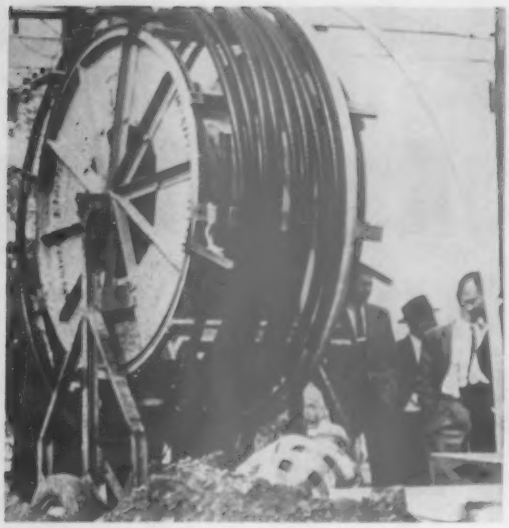


ALUMINUM pipe comes off a reel and goes . . .

THROUGH a plow blade and into the ditch.

Alcoa Develops New Pipe-Laying Machine

AN INSTALLED cost of about half that of steel pipe is claimed for 2-in. aluminum pipe laid by a machine which digs the trench and lays and covers the line in one operation.

The pipe-laying machine was adapted by Aluminum Co. of America from methods which have worked well in burying telephone cables.

In a recent demonstration in Denver, the machine laid pipe at the rate of 3 miles per hour. A reel capable of holding a mile of coiled 2-in. pipe was mounted on a trailer coupled to a plow with a hollow curved blade. The machine was pulled by a Euclid TC 12 tractor.

First a short section of ditch was dug. Pipe was fed through the plow and anchored at the end of the trench. The tractor then moved across a field, with the pipe being unreeled through the plow into a 42-in. deep trench which was backfilled in the same operation.

Alcoa said the machine could be used to advantage on flow lines and gathering lines of small diameter. The company's strategy is to cut costs—now above steel pipe—in order to get a share of this business for aluminum. The metal is desirable for its corrosion resistance and its smooth interior.

PROCESSING BRIEFS . . .

American Chemical Corp., jointly owned by Richfield Oil and Stauffer Chemical, set up headquarters at their new petrochemical plant in Long Beach. The plant will go on stream in early 1960, producing chlorinated hydrocarbons and polyvinyl resins.

Goodrich-Gulf Chemicals will build a plant at Port Neches, Tex., for the production of 13 million pounds per year of a new type of high-density polyethylene. The construction, by Ralph M. Parsons Co., will start immediately and is scheduled for completion in late 1960. The polymer produced by this newly developed process is especially suited for use in bottle, pipe, wire and cable applications.

Continental Oil Co. and Wilshire Oil Co. jointly will build petroleum products terminals at Phoenix and Tucson, Ariz. The two terminals will be supplied from Southern Pacific's Los Angeles-to-El Paso products pipeline. Continental is completing two other terminals at El Paso and Albuquerque and has just finished a 157-mile 6-in. products line from its refinery at Artesia, N. M., to El Paso. It connects with the Southern Pacific line to Tucson and Phoenix, and the Standard Pipeline Co. line to Albuquerque (OGJ, Dec. 7, p. 89).

Richfield Oil has purchased part of the marketing of Lamson Oil, Providence, R. I. Lamson operates 125 service stations in Rhode Island and Massachusetts. Lamson will become a division of Richfield.

A sulfuric acid alkylation unit for Aurora Gasoline's Detroit refinery will be completed by Refinery Engineering next month. Completion of the 8,000-bbl. naphtha Unifining unit will be delayed indefinitely due to the steel strike.

Also for Refiners . . .

IN THE NEWS: LPG sales reach their all-time high in 1959 with the big market still household and farm use (p. 45) . . . Coal industry attacks increased quotas for residual (p. 54) . . . Diesel engines are gaining ground overseas in the passenger-car market (p. 56).

PLUS THESE TECHNICAL REPORTS: New instrument determines catalyst size distribution (p. 70) . . . Standardization cuts centrifugal pump costs (p. 72) . . . New activated sludge equipment upgrades waste treatment (p. 75).

THE WELLHEAD of Sarajeh No. 2, the real discovery well of Iran's newest gas-condensate field, gets a thorough going over by four men* associated with Iran Oil Co., exploration arm of National Iranian Oil Co.

Sarajeh: Iran's Next Big Field

• The field has received little attention outside Iran due to its famous neighbor, Alborz field. But Sarajeh looks as if it will be supplying gas or condensate to some parts of Iran before Alborz is proved commercial.

Paul Swain
International Editor

"SHE nearly blew out on us. Began to break out 2 miles away and then walk right toward the rig makin' a new pothole and a new gas spurt every little bit.

"It's a little scary to think about it now, but we were too busy at the time to think much about anything except killin' that hole".

That's the way Albert Crownover, lanky, loose-jointed Houston drilling engineer, remembers the Sarajeh No. 1 one day in August 1958.

The Seacat Drilling Co. crew had just started testing the first few feet of the Oligo-Miocene limestone at 7,909 ft. when the high-pressure gas flow developed an incipient crater.

"There was nothing but surface casing in the hole", Crownover recalls. "About all we could do was pour the cement to her".

They had to leave 6,900 ft. of drill string in the hole, but with the nearest gas-mud geyser only half a mile from the rig floor, no one questioned the wisdom of forgetting the drill pipe.

In the months since the well was killed, it has been necessary to make periodic trips to the site and bail out the 59° distillate that fills the deep well cellar. Except for its blue-green color, this fluid might be mistaken for straight-run gasoline.

Thus, was born the most promising field yet discovered by Iran Oil Co.

Sarajeh No. 1 was far from an unqualified success, but like Alborz 5, it served only to convince the National Iranian Oil Co.'s exploration subsidiary that the Iranians themselves could establish oil production in the Central Iranian basin.

Drilling progress . . . The Sarajeh structure was the second big surface structure found by the Iranians in the early exploration of the basin in the early 1950's. It is about 3 miles southeast of Qum. Smaller than Alborz, Sarajeh is about 30 miles long and 6 miles wide at its widest point.

It was the second choice of the Iranians, but today it is almost certain to yield commercial oil production before the riddle of Alborz is solved (OGJ, Dec. 14, p. 63).

Sarajeh No. 2 was drilled down structure from the initial ill-fated test and was more impressive. Tests made of the limestone interval, 8,033-38 ft.

* IN THE PHOTO, left to right, are Albert Crownover, Seacat Drilling Co. engineer; S. T. Turabi, technical director of IOC; Abdollah Azarbarzin, IOC pilot; and an unidentified Iranian engineer.

produced 330 bbl. of 54°-gravity oil and gas. The gas-oil ratio on this first test was almost 17,000: 1.

A second interval, 8,545-86 ft. produced 440 bbl. daily of a slightly heavier condensate with a gas-oil ratio of 14,000:1.

IOC officials calculate that open-flow potential of this well is 2,800 bbl. daily of high-gravity condensate and 40,500 M.c.f. of gas daily. The second well has been shut in since the tests because there is no pipeline outlet for either the gas or condensate. The pressure gage on its christmas tree registers 4,900 psi.

The third and fourth Sarajeh tests were located further down the flanks of the big structure in an effort to drill into the limestone formation well below the assumed gas cap.

Last week No. 3 had been drilled to a total depth of 8,655 ft. and the crew was busy sidetracking a fish in the hole at 8,490 ft. The No. 4 had reached 9,168 ft. and 9⅝-in. casing was landed at 8,592 ft.

"Even if this field proves to be predominately a gas producer rather than an oil field, Iran can certainly make use of the gas to take care of our deficits in fuel oil", Hussein Farkhan, petroleum engineer and assistant managing director of IOC says.

Farkhan makes no secret of his pride that this is a discovery made by the Iranians and being developed by the Iranians.

Demand growing . . . Iran certainly has no problems in meeting its fuel and energy needs, but at present the consortium's operating companies supply the internal oil needs of the country from the Abadan refinery.

Transportation bottlenecks may plague NIOC in keeping up with increasing demand even though the supply is plentiful and easily available. Too, the Iranians obviously would like to be able to supplement this Abadan products supply with one of their own. That's what they intend to do from Sarajeh and possibly from Alborz.

"Our consumption has increased at the rate of 14% a year for the last 5 years," Farkhan points out. "We were using about 18,000 bbl. daily in 1950. This year that will be at least 52,000 bbl. daily.

"Our internal consumption by 1963 will be between 100,000 and 120,000 bbl. daily."

At present, Iran's oil needs move to Teheran and the more populous north by rail and a 10-in. products pipeline built about 2 years ago.

"The present capacity of this line is only 20,000 bbl. daily, and the maximum throughput of the line with additional pump stations would only be 44,000 bbl. daily.

"No fuel oil moves by the pipeline at all. It all moves by the already heavily-taxed railroad."

"We want to add a 6-in. line to the Caspian and have already built 6-in. line to Isfahan from Azna.

"So, you see even if Sarajeh remains a very high ratio gas-producing field, the gas can be piped to Teheran and used perfectly to met our fuel oil demands and relieve the railway system."

At the rate, the IOC drilling people are pushing down wells at Sarajeh, this might well be the next oil industry construction program for Iran.

High Flows Reported in Wells Off Trinidad

TRINIDAD'S best oil field in years may be in the making in the Gulf of Paria.

Dominion Oil, Ltd., is getting ready to run initial bottom-hole pressure surveys on South Domoil 1 and 2. The surveys will be preliminary to starting extensive production tests. The two offshore wells are 30 miles southwest of Port of Spain, near the Venezuelan boundry.

The California Standard subsidiary told the Journal that its South Domoil 1 discovery has produced 20,000 bbl. of oil since September 30. It would neither confirm nor discredit reports from Venezuela that the wells initially tested 1,000 bbl. and 1,770 bbl. daily of 45°-47°-gravity crude.

Dominion Oil's South Domoil 1 produces from perforations in a zone from 9,340-70 ft. South Domoil 2 was taken to a total depth of 9,957 ft. and perforated at intervals between 8,474-9,370 ft. It is located ¼ mile south of the discovery.

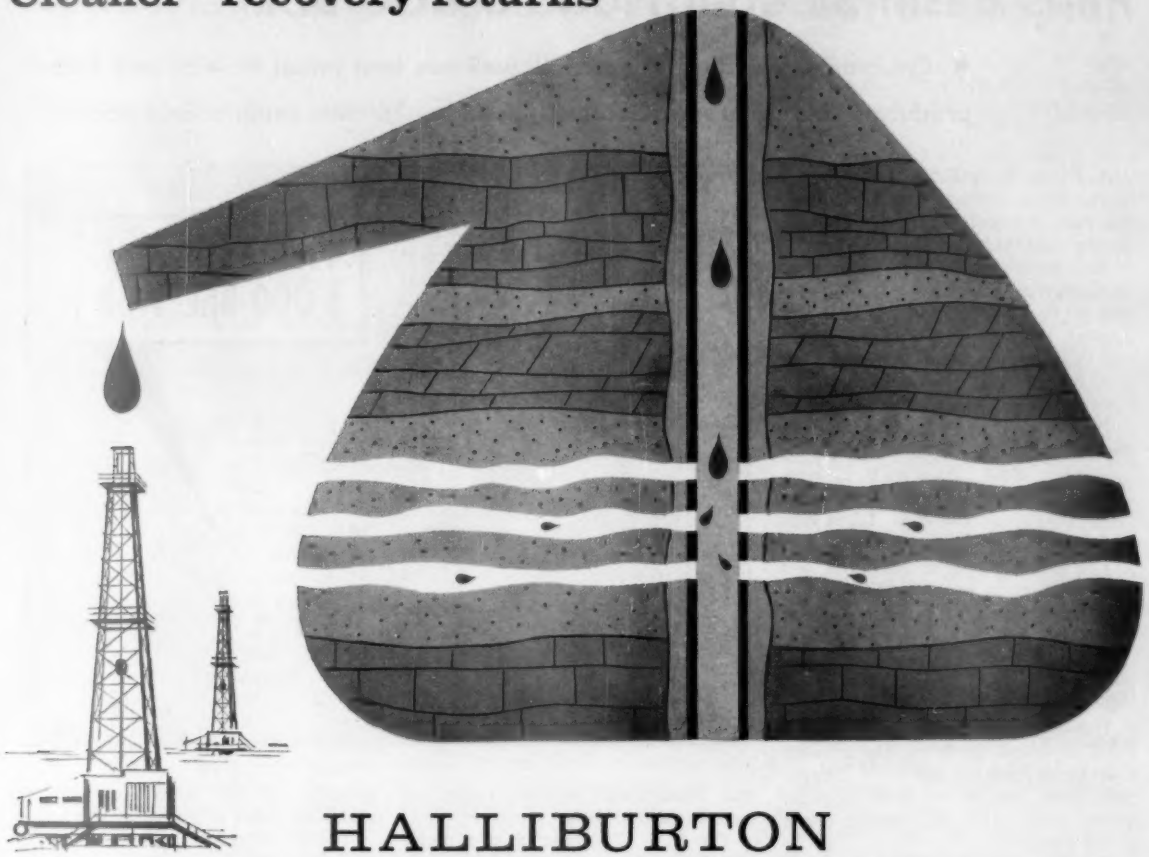
South Domoil 3 has been started ½ mile east of No. 2. It is drilling ahead at 6,400 ft.

The company is drilling in about 90 ft. of water with an S-55 jackup barge carrying a 103-E rig. The discovery was drilled to a total depth of 11,337 ft. from a floating barge.

But the company said earlier this year that completion problems from a floating platform had not been solved to the point where this type of operation would be satisfactory for development wells in the event of a discovery (OGJ, Jan. 12, p. 63).

The discovery was the fourth wildcat drilled in the Gulf of Paria by Dominion Oil. Brighton 1, Couva Marine 1, and Domoil 1 tests were dry holes. South Domoil is 15 miles north of Trinidad Northern Area's offshore field at Soldado.

Cleaner "recovery-returns"



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Paris Basin Sleeper Flows 5,000 Bbl.

• Coulommes field's thirty-second well has best initial flow of any French producer. RAP gets new 315-bbl. discovery 16 miles south of Brie pool.

A RUN-OF-THE-MILL field well in the Paris basin has come in with the best initial flow ever logged in France—5,000 bbl. daily.

The prolific producer was drilled in Coulommes field, about 30 miles east of Paris. Coulommes oil field is divided into two areas, Coulommes and Vaucourtois, and the new well was drilled in the Vaucourtois, or eastern side of the field.

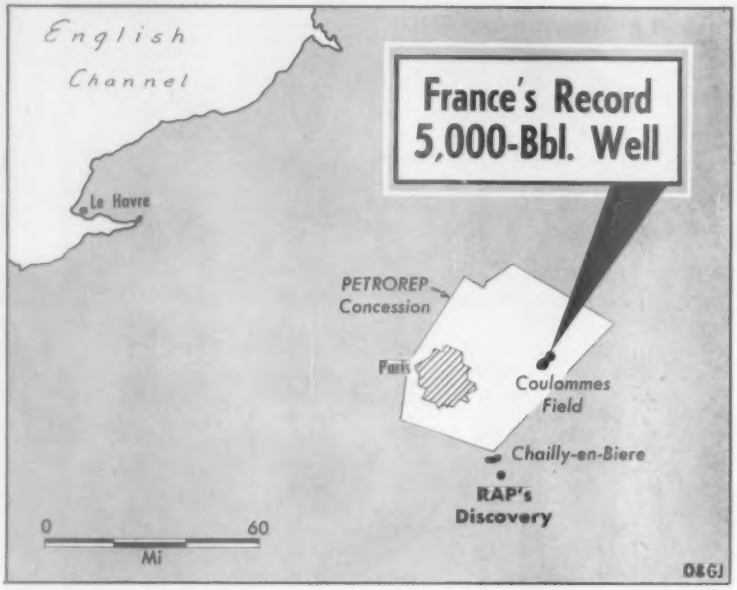
PETROREP last week had the well, the B. F. 21, cut back to a flow of 1,500 bbl. daily through a ⅜-in. choke. The company expects to stabilize output at 1,000 to 2,250 bbl. daily through a ¼-in. choke.

The chief geologist attributes the high production to a "quite remarkable permeability" for the area. The B. F. 21 is a normal development well spotted between other producers completed at a much smaller rate. It is Vaucourtois' thirty-second well.

The B. F. 21 entered the pay at 5,570 ft. below sea level. The production comes from the top of the Dogger limestones, and the oil is of identical quality with other 33°-gravity crude in the area.

The Vaucourtois area lies northeast of the initial Coulommes discovery. The geologist told a Journal representative that the B. F. 21 is well toward the end of the known structure, and may be one of the last in that direction. Another structure on the northeast side of Coulommes is linked to the field. But only one well has been drilled, and its potential is unknown.

About 6,000 bbl. daily production has been developed in the Paris basin since the discovery at Coulommes last year. Coulommes is the largest of several small fields with an output of over 4,000 bbl. daily.



The B. F. 21 came in at a better initial flow than the third Parentis well, which came in at 3,000 bbl. daily 5 years ago. Esso-Rep has fully developed the field, 70 miles southwest of Bordeaux with a flow of 23,000 to 24,000 bbl. daily.

Petrorep is a private French company owned 51% by Petrofrance, a local marketing and shipping company. The remaining 49% is held by Rothschilds and other French investment trusts.

Villemer find . . . RAP expects to produce 315 bbl. daily from a well about 40 miles southeast of Paris.

The Villemer 101 initially tested 22 bbl. per hour of light crude from the top of the Dogger section entered at 4,950 ft. Development drilling will be started to define the structure.

The new field is 16 miles south of Brie field, where RAP has seven producing wells. Brie is actually part of Chailly-en-Biere field lying on RAP's side of the concession line. The Chailly side of the field is on acreage held by CEP, which is producing more than 1,100 bbl. daily from 14 wells. The most recent wells make better than 300 bbl. daily.

Shell Resumes Persian Gulf Search Off Qatar

A NEW $5-million mobile platform will soon start making hole in the Persian Gulf off Qatar.

The "Seashell" is being towed to its first location following a commissioning ceremony at Doha Bay, Qatar. In attendance were the ruling sheikh, Ali Bin Abdulla al Thani, and officials of Shell Co. of Qatar.

The platform consists of a pontoon 209 ft. long, 105 ft. wide, and 17 ft. deep. Eight legs are 218 ft. long and 10 ft. square. The unit was designed to work in water up to 100 ft. deep and to withstand gales of up to 100 m.p.h. and waves of 30 ft. It carries a rig capable of drilling to 17,000 ft. Auxiliary equipment includes a 75-ton crane.

Two Dutch tugs towed the "Seashell" to Doha Bay from a Netherlands shipyard. The trip took 75 days at an average speed of 3½ knots.

The new platform is a replacement for one wrecked in a sudden storm 3 years ago. The first platform had drilled two dry holes on Shell's offshore concession, the second of which was 50 miles at sea.

Despite disappointing results in the first two wells, Shell decided to renew the program that had already cost $21 million. The first location for the "Seashell" also will be about 50 miles out. Projected target depth is 7,000 ft.

Reds Make Big Claims for Area West of Caspian

• Communists in China also are active. They're boosting production from Karamai field in northwest China.

RUSSIA has made a series of discoveries that could have far-reaching consequences.

The Soviet Minister of Geology, Pyotr Y. Antropov, has announced that new discoveries of oil and gas in Turkmenia and Uzbekistan promise to be among the richest in the Soviet Union. He said the area has an estimated producing potential equal to the Middle East.

Turkmenia and Uzbekistan are adjoining territories. Turkmenia is bordered on the west by the Caspian Sea, and on the south by Iran.

Russia also claims to have made an important gas discovery in the part of the Soviet where it is most needed —eastern Siberia. The reported strike m a Cambrian formation was made in the Osa River Valley about 93 miles north of the fast growing industrial center of Irkutsk, near Lake Baikal. The wildcat was completed at 7,960 ft.

Apparently there has been a difference of opinion among Russian geologists about the prospects of the region. The publication which reported the find said the discovery disproves the belief of some that oil and gas could not be found in the Cambrian rocks typical of eastern Siberia.

Antropov discussed the Turkmenia success in an article in Pravda that urged stepped up effort in exploration and production. He said exploration will have to be stepped up in order to keep pace with the country's 7-year plan for oil. The first year is almost over.

Russia's production goal for 1965 is 4,500,000 bbl. Actual output the third quarter of this year was 2,688,000 bbl. daily.

The minister rapped the former ministry of oil production that is now abolished. He said the ministry had not given the country its money's worth.

Besides the Osa River find, gas also has been discovered further east in far eastern Yakutsk, in Vilyuisk basin. Gas and oil finds also were reported in the Berezovo region of Siberia, near Ob river. Antropov said work along the lower Volga indicates areas resembling the Gulf of Mexico embayment, "which yields 70% of the oil in the U. S.".

Chinese busy . . . A 4-year-old group of fields in a remote corner of northwest China have taken the lead as the country's chief source of rising crude production.

Official Chinese Communist reports say the young Karamai area is responsible for record output being achieved this year. The fields reportedly are averaging more than 150% better than last year.

Production figures for Karamai itself have not been given. But the Red government says total crude production the first 9 months exceeded the 2,260,000 metric tons produced in all of 1958.

This would give China a January-September average of more than 60,000 bbl. daily, compared with about 45,000 bbl. daily last year. Output for 1957 was 1,460,000 tons, or about 29,000 bbl. daily.

Karamai production is from Dzungarian basin, located in Sinkiang Uighur Autonomous Region. Whether Karamai is considered several pools in one field, or a number of separated fields in the same general area, is not known.

Despite growing crude production and refining capacity, China still imports almost half its oil from the Soviet Union. Last year these imports averaged 13,400 bbl. daily of crude and 36,700 bbl. daily of products.

Jersey Seeks Exploration Rights in Greece

THE GREEK Government and a Jersey Standard subsidiary have signed an agreement for exploration and development concessions in two areas of Greece.

The contract gives Esso Hellenic, Inc., rights over two regions covering a total of 1,540 sq. miles. The acreage lies in the general area of the islands of Paxi and Zakynthos off the southwestern coast of Greece, and in the areas of Killini and Pylos in western Peloponnesia.

If the Greek Parliament approves, Esso Hellenic will spend at least $6.4 million if operations are continued for 8 years. If no discovery has been made by that time, the entire area will be surrendered to the government.

In case of a commercial discovery, the company will have the right to select a development concession. This would have a duration of 30 years with a 10-year extension. Profits would be split on a 50-50 basis, with the government getting 50% of the net, including a 12½% royalty.

Esso will be the only company exploring in the country. Deilmann, a German firm that had carried on a joint exploration program with Hellenic Sun, give up its program in Greek Thrace earlier this year.

Malayan Peninsula May Get Refineries

THREE REFINERIES have been planned on the Malayan Peninsula, where at present there are no plants at all.

Subsidiaries of Royal Dutch-Shell have applied for permission to build two of the refineries. A survey team will leave shortly for the area to study suitable locations.

Shell wants to build a $13-million refinery at Singapore and a $20-million plant somewhere in the Federation of Malaya. The plants would be designed to fill existing and future demand for the company's products in each area.

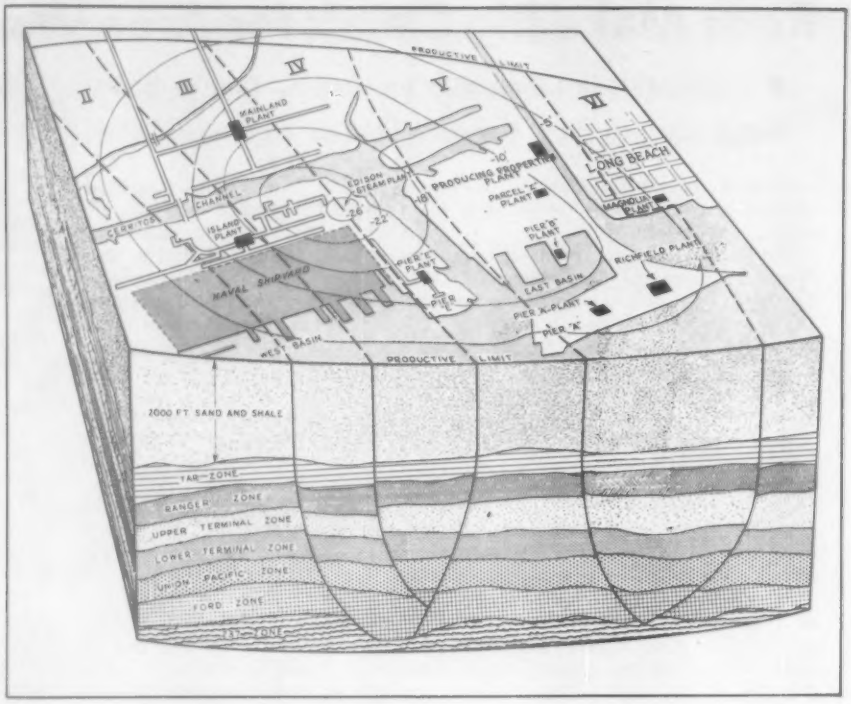
Singapore and the Federation are separate from each other politically, and official application for a pioneer status of the projects has been made with each government.

Standard-Vacuum has proposed the third refinery project. It has asked the Federation of Mayala for permission to build both a refinery and a fertilizer plant at a total investment of $32 million.

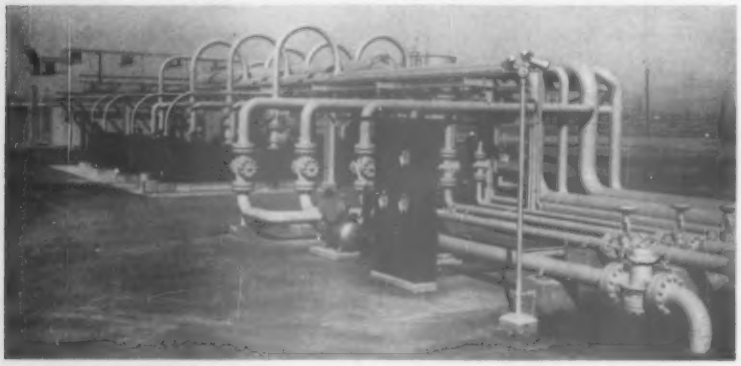
The Stanvac refinery would be big enough to cover the company's present and future needs in Malaya. The fertilizer plant would be built in association with Chang Corp., of New York, which would handle design and construction. The plant would supply local needs for nitrogenous fertilizers.

OPPOSITE PAGE

SCHEMATIC FLOW DIAGRAM of the Mainland water-injection plant, capable of supplying 287,000 bbl. of high-pressure water daily.



CROSS-SECTIONAL MAP of Wilmington field, showing the various zones and how the field is divided into fault blocks. The surface contours indicate the extent of subsidence.



MAINLAND PLANT, with the greatest high-pressure capacity of any water-injection plant in the world, will supply water to 57 injectors.

ISLAND PLANT'S six centrifugal pumping units can supply 157,000 bbl. of 850 to 1,250-psi. brine.

New plants

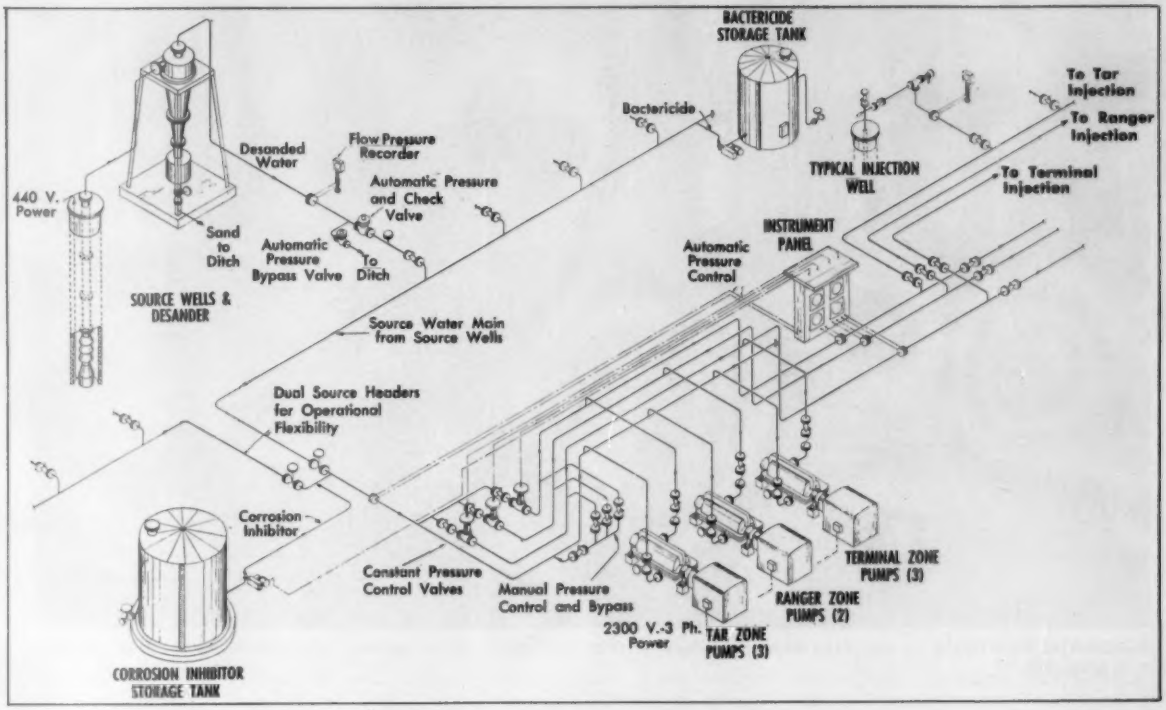
NEW STANDARDS for capacity, compactness, and automatic control in high-pressure water injection have been set by two plants recently completed in California's Wilmington field.

At both plants, electric motors drive multistage centrifugal pumps. The larger can supply 287,000 bbl. of water at pressures of 850, 1,050, and 1,250 psi. The smaller has a capacity of 157,000 bbl. daily.

Both operate unattended. Automatic controls maintain the desired line pressures, and shut down any pumping unit in the event of an electrical or mechanical malfunction. Weatherproof electrical equipment is used throughout, eliminating the need for housing.

Addition of these two plants boosted the field's total injection capacity to 874,000 bbl. daily. Completion of two other planned plants will bring the total to more than 1,000,000 bbl. daily. Actual injections were expected to average more than 400,000 bbl. daily during December. They may reach the 1,000,000-bbl. level by next midyear.

Dual-purpose flood. The huge proj-



boost Wilmington's water-injection capacity

ect is being undertaken for a dual purpose: To increase oil recoveries and to check land subsidence. As to the former, water flooding is expected to add about 400 million barrels to the estimated 1.3-billion-barrel primary oil recovery.

Land subsidence is the reason the project was undertaken with such haste. Withdrawals of fluid and gas are believed to be the major cause of subsidence. Various studies have shown that almost all of the surface sinking can be accounted for by compaction in the Tar, Ranger, and Terminal zones (see map). Studies also show that greatest subsidence has occurred in the area where oil and gas withdrawals have been the greatest.

The two electric plants will supply water for injection wells in the vicinity of the Long Beach Naval Shipyards—near the center of the bowl-shaped sinking area which now extends over 20 sq. miles. Subsidence at the center of the bowl (see map) has reached 26 ft. and is continuing. Annual rate of subsidence at this point is now about 0.9 ft. per year, compared with a 2.4 ft. in 1951. An ultimate subsidence as high as 43 ft. was forecast by some engineers unless corrective measures were undertaken.

That water injection into the four upper zones is the cure, has been proved by project in the vicinity of Pier A. Periodic elevation surveys made during the past 2 years show that subsidence has been stopped in a 700-acre area and greatly reduced in an additional 1,100 acres.

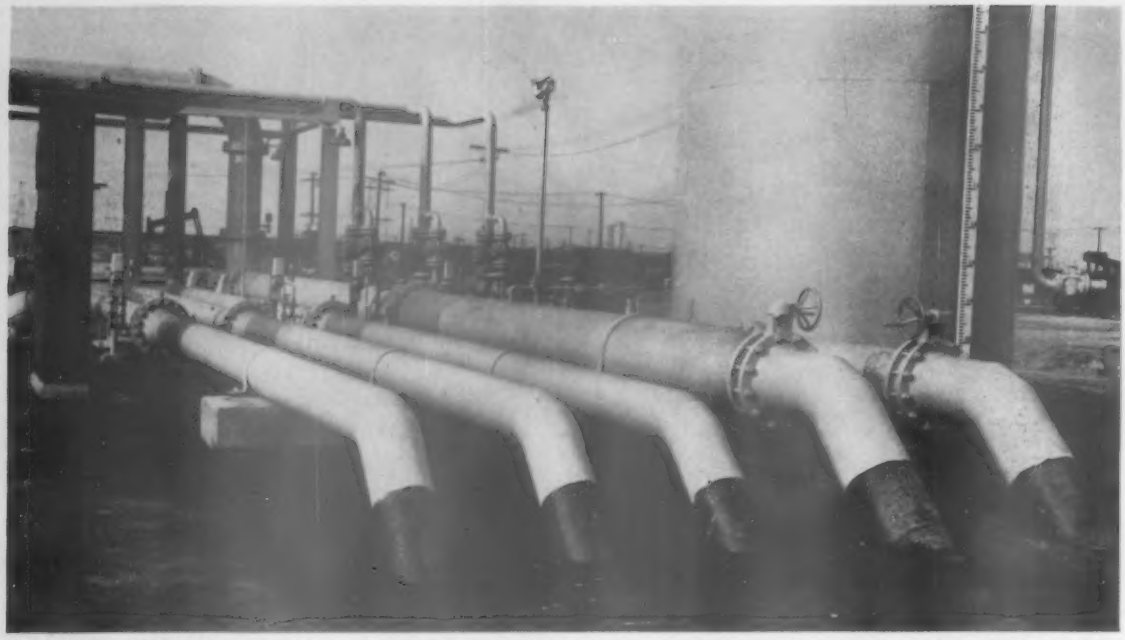
Flooding is being carried out by fault blocks, either on a cooperative or unitized basis. Peripheral injection wells along with upstructure oil-zone injection wells are being utilized. In late November about 100 wells were receiving water, with plans calling for an ultimate of 268 injectors. (For further information on how the flood is being carried out, see The Oil and Gas Journal, August 31, 1959, page 55, and The Oil and Gas Journal, July 27, 1959, page 107.)

Data on plants. As the city of Long Beach owns about 42% of the field's 73,000-bbl. current daily oil production, it took the lead in providing injection facilities. Of the nine plants shown in the accompanying map and table, all but one are owned by the city. The city's two contract operators, Long Beach Oil Development Co. and Richfield Oil Corp., operate most of the plants.

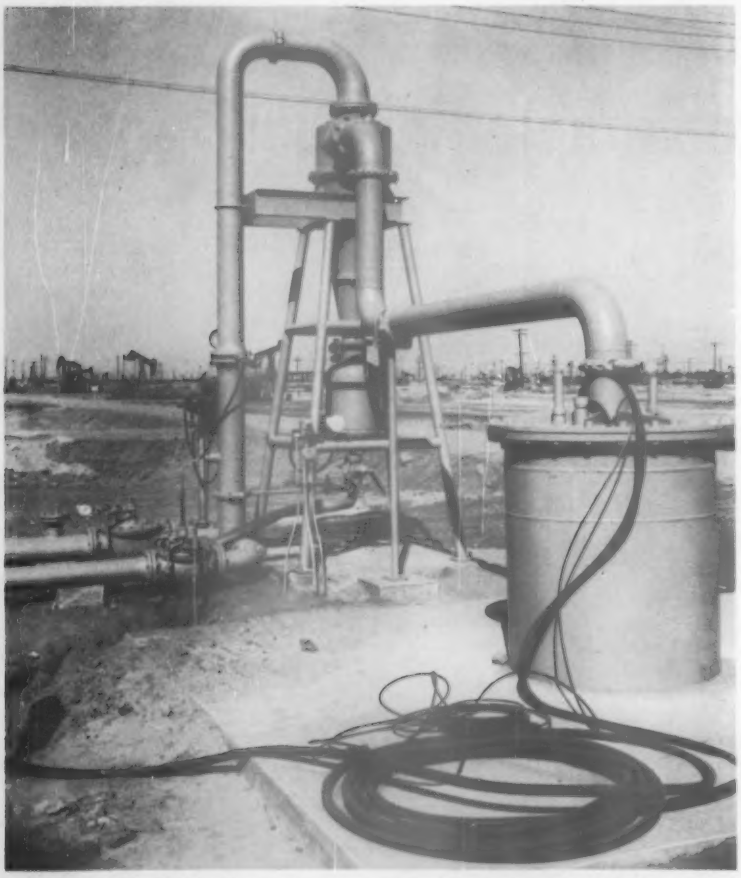
BY D. H. STORMONT
District Editor

LBOD operates the Pier A, Pier E, Pier B, and Seaside Boulevard plants. Richfield operates a second Pier A plant and will be in charge of the Magnolia plant when it is completed next January. Both the island and mainland plants are operated by Union Pacific Railroad Co., which will act as unit operator for fault blocks II and III as soon as the properties in those areas are unitized. Only privately financed plant is that of Producing Properties, Inc., on the west berm of the flood-control channel.

Cost of these plants, which totals almost $6,000,000, will be recovered through a surcharge on each barrel of water pumped underground during the next 10 years. In addition to the



AUTOMATIC CONTROLS in the three discharge lines (left) at the Island plant operate to maintain the desired distribution pressures.



SHALLOW SOURCE WELLS supply an average of more than 30,000 bbl. each of oxygen-free brine to the two injection plants. Any produced sand is removed in the cyclone-type desander in rear of the well.

plants shown in the table, another 165,000-bbl. plant is to be built for supplying water to north-flank injection wells.

As the table shows, the per barrel capacity cost of the plants varied widely. The new motor-driven centrifugal plants cost about $3.00 per barrel capacity. That of the smaller engine-powered plants averaged about $7.00 per barrel, with the cost varying widely due to size and site-preparation expenses. Distribution system for new electrical plants ran much higher than the others because the injectors they serve are much more widely dispersed.

Midland plant. An accompanying schematic diagram illustrates the flow of water through the island and mainland plants, which are almost identical except for capacity and equipment sizes. Both receive salt water at about 25 psi. and discharge it at pressures of 850, 1,050, and 1,250 psi.

A three-pressure field distribution system was chosen because of its greater economy. Under this system, each well can be connected to any of the three lines as its injection pressure dictates. The alternative would have been to install all pumps with a 1,250-psi. discharge. Initial cost of such a high-pressure plant and system would have been less, but it would have been more than offset by higher operating costs.

At the mainland plant, three horizontal centrifugal pumps discharge

TO ASSURE the plants of any adequate water supply, the source wells are produced at near capacity rates. The pressure control and check valve (left) limits the amount entering the system, with the bypass valve (foreground) acting to dump the excess water.

DESANDING UNITS are equipped for manual dumping. A radioactive level-sensing device on the side of the sand pot shuts in well if the level becomes too high.

water for Tar Zone wells at 850 psi. Two units supply 1,050-psi. water for the Ranger, and three discharge 1,250-psi: water for the two Terminal zones. They are directly driven by 500, 750, and 900-hp., 3,600-r.p.m. squirrel-cage induction motors. The six and eight-stage centrifugals are of stainless-steel construction. The motors operate on 2,300-volt, 60-cycle current supplied from a stepdown transformer.

The island plant consists of two 450, 500, and 700-hp. centrifugal units for each zone. Discharge pressures are the same as at the mainland plant.

Automatic pressure controllers and control valves in each of the three discharge headers operate to maintain the desired line pressures. In the event of either an electrical or mechanical malfunction, individual automatic controls immediately shut down the unit. Indicator lights on the instrument panel signal the nature of the failure.

Meter runs and orifice-type meters provide a continuous record of the total flow through each of the distribution systems. A flow-control valve regulates flow of water into each well, where the volume also is recorded. The island plant ultimately will serve 41 wells, and the mainland will provide water to 57 injectors.

Source wells. Water for the two plants is obtained from nearby source wells which produce filtered ocean water from depths of 140 ft. A total of 10 wells are connected to the mainland plant and 5 to the island plant. Submersible motor-driven pumps, of noncorrosive construction throughout, lift the salt water to the surface.

Before the water enters the field gathering system it is passed through a cyclone-type desanding unit, rubber lined throughout. These remove 98% of all material with a specific gravity greater than 2.6 which collects on a 200-mesh screen.

The separators are equipped for manual dumping. But to insure the sand will not biuld too high, a radioactive level-sensing device (cesium isotope) is installed about midway up the side of the grit pot. Working through a relay, the device automatically shuts in the 75-hp. motor when the sand builds up to a level which interferes with the gamma ray beam.

The source well pumps operate at constant speeds at all times, discharging into 14 to 30-in. mains. A combination check valve and pressure-control valve, set at about 30 psi., insures that as much water as the plant requires will enter the main from each well. If a well produces excess water, as is the case when the plant is not operating at full capacity, a bypass valve automatically opens and the excess water dumped.

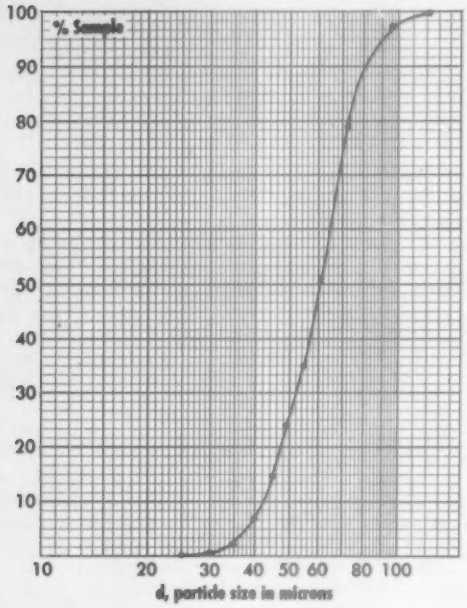
DATA ON WILMINGTON WATER-INJECTION PLANTS

Location—	Fault blocks served	Capacity (B/D)	Date comp.	Approx. cost		Pumps		Prime mover	
				Plant	Dist. system	Type	Discharge press. (psig.)	Type	Rating (hp.)
Terminal Island	II-III	157,000	10-59	$469,691	$232,899	Centrifugal	850-1,250	motor	450-700
Mainland	II-III	287,000	10-59	770,036	437,700	Centrifugal	850-1,250	motor	500-900
Pier A-LBOD	IV-V	123,000	10-58	938,000	*40,000	Quintuplex	1,270-2,000	gas engine	500
Pier E	III-IV	135,000	9-59	790,307	56,274	Quintuplex	1,050-2,000	gas engine	500
Pier B†	V	21,000	5-53	170,840	*10,000	Triplex	920-1,090	gas engine	100
Pier A-Richfield	VI	66,000	1-59	675,906	98,000	Quintuplex	1,250-2,500	gas engine	100-200
Seaside Blvd.	V	65,000	9-59	447,000	30,000	Quintuplex	1,050-2,000	gas engine	500
Magnolia pier	VI	50,000	1-60	*300,000	*10,000	Centrifugal		motor	
Flood control channel	VI	20,000	9-59	150,000		Triplex	1,400	motor	100

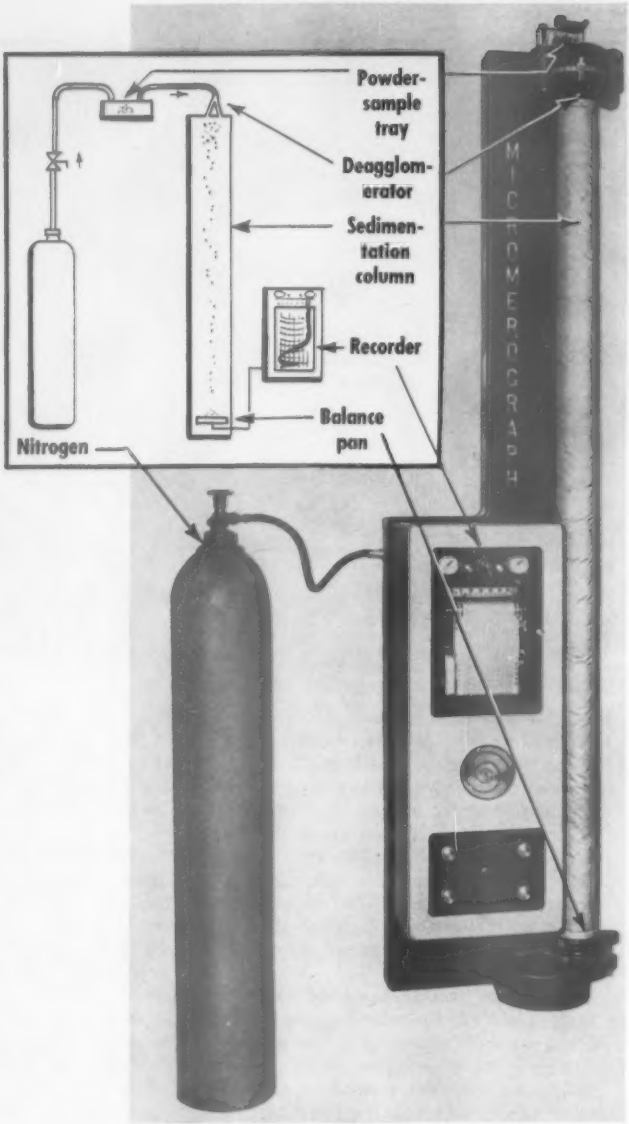
*Estimated cost. †Plant originally built for carrying out pilot floods.

Fluid-catalyst particle-size distribution speeded by new instrument

BY KENNETH W. BROOKS
District Editor



FINAL GRAPH shows per cent of sample less than given micron size. Fig. 1.



SAMPLE placed in holder is discharged into column by blast of nitrogen from cylinder. Removable balance pan collects falling particles. Fig. 2.

SIZE DISTRIBUTION of fluid cat cracking catalyst is being determined quickly on a routine basis at Standard Oil Co. of Indiana's refinery at Sugar Creek, Mo. This is accomplished by a Micromerograph, Model X-C. Manufactured by Sharples Corp., the Micromerograph is based on the application of Stokes' Law of Fall for the terminal velocity of particles falling through a gas.

The instrument is also being used by other Standard of Indiana refineries and subsidiaries, which send in samples of fresh catalyst to Sugar Creek for size-distribution analysis.

Catalyst-particle size is critical in cracking operations, and this instrument furnishes a rapid, convenient method of determination.

Principle of Operation

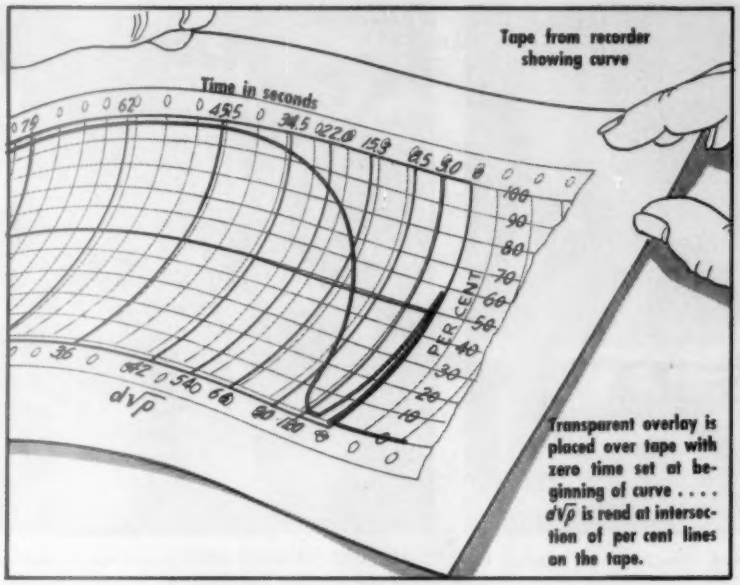
The sample to be determined is placed in the powder-sample tray (Fig. 2), and a burst of compressed nitrogen forces the sample through a "deagglomerator." This device is an adjustable orifice and breaks up the sample into a cloud of separate, discrete particles which is introduced near the top of the sedimentation column.

This column is made of aluminum and is insulated with a glass-fiber blanket. The tube is 85 in. long and 3½ in. in inside diameter. Slight differences in time of fall for particles of the same size are made unimportant by the relatively great length of the column (220 cm.).

The particles fall at their terminal velocities to the pan of a servoelectronic balance.

As the particles accumulate (Fig. 2), a sensing device applies a signal to the electronic system of the instrument. This in turn applies a current to a restoring-force coil on the balance beam. The current required to maintain a balance becomes a continuous measure of the cumulative weight of the powder in the balance pan.

The same current that provides a counterbalance for the weight of the powder in the pan actuates a moving-chart recorder. This chart is visible throughout the determination and furnishes a continuous record of the weight of the catalyst accumulated in the pan versus time. Depending on


Tape from recorder showing curve
Time in seconds
PER CENT
$d\sqrt{\rho}$
Transparent overlay is placed over tape with zero time set at beginning of curve . . . . $d\sqrt{\rho}$ is read at intersection of per cent lines on the tape.

TEMPLATE correlates rate of fall with $d(\rho)^{1/2}$ according to Stokes' Law. Fig. 3.

TABLE I—SIMPLE ARITHMETIC CONVERTS DATA TO USABLE FORM. CHART GIVES RESULTS ON ONE SAMPLE

Time observed seconds	Chart	$d(\rho)^{1/2}$	98.0 minus per cent reading	% Sample less than given particle size	d, Microns
0.0	0.0	150	98.0	100.0	124
5.0	2.4	120	95.6	97.6	99
8.5	20.6	90	77.4	79.0	74
12.7	47.0	75	51.0	52.1	62
18.6	63.8	60	34.2	34.9	55
22.0	74.0	54	24.0	24.5	50
28.3	83.6	48	14.4	14.7	45
34.5	91.0	42	7.0	7.1	40
45.5	95.6	36	2.4	2.5	35
	97.0	30	1.0	1.0	30
	98.0	27	0.0	0.0	25
	98.0	24			

the density and size of the particles, the time required for the operation varies from a few minutes to 3 hours.

According to Stokes' law, the time required for a particle to fall is inversely proportional to the square of the particle size (measured in microns) and to the density, ρ. The information recorded on the chart is used to obtain a particle size-distribution curve showing the weight percentage of particles smaller than any given micron size.

A transparent overlay template provides a method to derive the data for plotting this curve. The template converts the time scale on the recorder chart into $d(\rho)^{1/2}$ where d is the particle diameter. This number is then divided by the square root of the bulk density of the catalyst to obtain the diameter in microns. For catalysts of known densities this calculation can be eliminated by the use of special templates supplied by the manufacturer.

First step in determining a catalyst-sample distribution is weighing out the sample (0.035 to 0.04 g). Next, Anstac, an antistatic solution, is charged into the sedimentation column and evaporated with a stream of nitrogen. This antistatic agent prevents a charge from accumulating which would tend to hold the particles in suspension and prevent them from falling at the rate predicted by Stokes' law. A swab, slightly moistened with the antistatic agent, is then used to wipe out the column. After these preliminary operations, the weighing device is zeroed, and the powder sample is discharged into the system under pressure from the nitrogen cylinder. Initial readings on the recorder are taken at a tracing rate of 6 in. per minute. After a plateau has been reached, the speed may be adjusted to 6 in. per hour.

Sample calculation . . . Fig. 3 is a typical record of a powdered sample whose size distribution was determined by this instrument. Table 1 is a summary of the data and calculations necessary to plot a size-distribution curve.

The required information is simple to calculate and may be done using the following steps:

1. The transparent overlay is placed over the curve traced by the recorder, taking care to line up the beginning of the curve with zero time. "Per cent" readings are taken from the curve in Fig. 2 and listed under the column headed "Chart" in Table 1. These readings are a measure of the amount of catalyst sample which has accumulated on the balance pan over a certain period of time. (Although it is not necessary to the calculation, we have included in Table 1 the time observed for this "per cent" of the catalyst sample to fall. These data are listed under the column headed "Time Observed.")

2. Readings are converted directly to $d(\rho)^{1/2}$ by the use of the template (Fig. 3) and listed in the appropriate column.

3. Subtract the readings under "Chart" from 98. The continuous record approaches a number near 100 asymptotically. When the recorder-chart curve reached 98 and stayed there for several minutes, the sample had fallen to the balance pan, and this number was taken to represent 100% of the sample. The use of 98 instead of 100 allows for 2% loss of fine particles. The readings are subtracted from 98 merely to reverse the order for convenience in reading and plotting the curve.

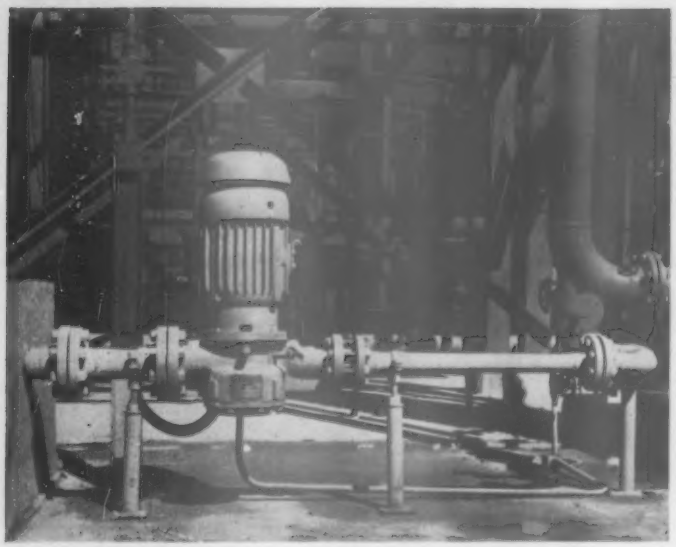
4. Using the highest reading appearing on the recorder chart as a basis, convert the above values to per cent. The results of this calculation appear in Column 4.

5. Make a separate determination of density of sample. (The catalyst referred to in the table had a density of 0.685 g. per cc.).

6. Divide $d(\rho)^{1/2}$ by the square root of the density to get the particle size in microns.

Finally a curve is prepared (Fig. 1) showing the per cent sample less than a certain micron size.

The Micromerograph is simple, fast, and accurate. It will accommodate a wide range of particle size and material, and provides a continuous curve showing all the details of the particle-size distribution of a catalyst sample.



NEW STANDARD PUMP is mounted directly in a piping run without concrete foundation. Fig. 1.

CONGESTED PROCESS AREA poses no problems for the standard pump. Fig. 2.

Standardization cuts pump costs

- Installed costs drop 20 to 30%, and maintenance costs 15 to 25% by using new standardized vertical centrifugal pump at Shell Chemical's Houston plant. This new pump meets performance requirements for 80% of the installations.

BY R. G. JOBE
Senior Engineer
Shell Chemical Corp.
Houston

A NEW vertical centrifugal pump with an integral electric driver meets the performance requirements for 80% of the centrifugal pumps at Shell Chemical Corp.'s Houston plant, and only one case size is required.

The pump was developed as the result of a study of the capital and maintenance costs of 650 centrifugal pumps. This study showed the need for simplified installations and maximum interchangeability.

One year of field testing shows that the installed costs are 20 to 35% below those of conventional medium-duty horizontal centrifugal pumps of cast-steel construction. These savings are due largely to elimination of concrete foundations and shaft couplings.

During the 6-month period ending July 1 there was only 1 failure experienced out of 16 pumps in service. This was a mechanical seal failure because of abrasive particles in the product stream. The faces were changed to tungsten carbide, and operation has since been without incident.

Paper presented at ASME annual meeting, Atlantic City, Nov. 30-Dec. 4.

Labor requirements to remove and install the new pump are about one-fourth of those for horizontal centrifugal pumps.

We have purchased several complete standard pumps for stock as replacement when maintenance is required on the pumps in the field. Maintenance costs are 15 to 25% less than for comparable horizontal centrifugal pumps.

Economic Requirements

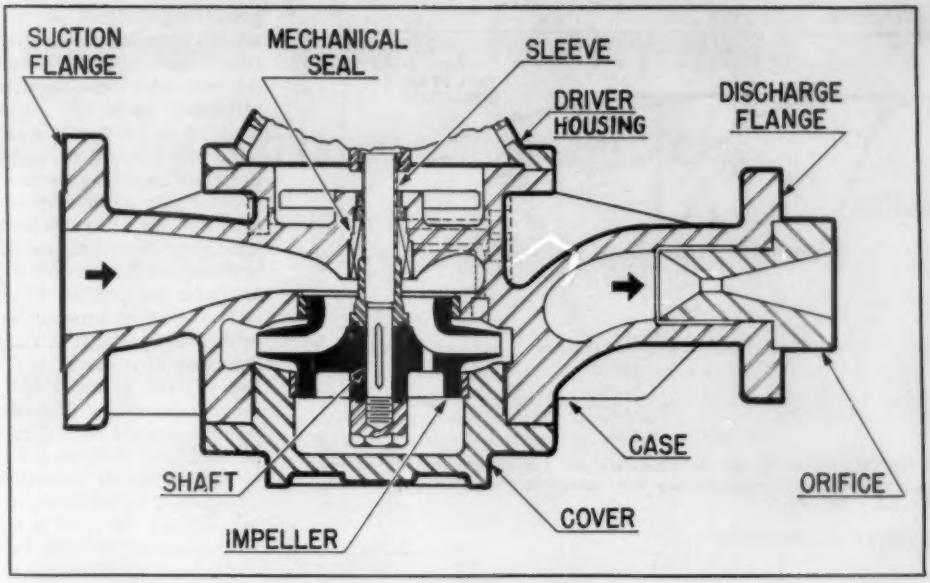
Comparison of continuing costs with capital cost showed that on the average, during the life of the pump, the sum of the continuing costs (maintenance, power, oil, etc.) would exceed the capital cost by several hundred per cent. This indicated that the standard design should emphasize reduction of the continuing costs.

This means that capital costs were not to be disregarded, but that maintenance costs would be favored in cases where compromises would be required.

Further analysis showed that maintenance costs were one of the most important factors contributing to the continuing costs. In view of this fact, it was apparent that maintenance cost reduction should be one of the primary objectives of the standardization program.

Pump concept. Further study of our maintenance costs led us to conclude that (1) the standard pump should be designed so that it could be quickly removed from service for shop repairs, (2) the pump should be simple to dismantle and reassemble in the shop, and (3) the pump should be designed to use a minimum number of component parts.

The installation and removal steps are an integral part of the maintenance



SEVEN MAJOR PARTS of the pump are case, cover, impeller, shaft, mechanical seal, sleeve, and orifice. All similar parts are dimensionally interchangeable between pumps. Fig. 3.

procedure. Ease of dismantling and reduction in the number of parts are features which would be expected to reduce cost of repair parts and further reduce maintenance labor costs.

To establish the range of head and capacity required to serve our plant, the design points for all existing pumps were plotted on one head-capacity chart for comparison. Analysis of the distribution of these points led to the conclusion that the standard pump should be capable of developing a shutoff head of at least 200 ft. and at a capacity of 250 g.p.m., a head of 120 ft.

The data indicated that a pump meeting these requirements would handle approximately 80% of the centrifugal-pump applications in our plant. In order to have a compact pump practical for lower-capacity applications, we decided that performance beyond these limits should be handled by a larger pump.

Requirements for Standard Pump

Evaluation of the over-all economics and performance requirements established the following criteria for the selection of a standard pump:

1. The pump should be capable of providing sufficient capacity to meet the performance requirements for the majority of the centrifugal pumps in a plant.
2. The pump must feature maximum dimensional interchangeability both in mounting dimensions and pump parts.
3. The pump must be easy to remove and install.
4. The pump should use a minimum number of parts.
5. The pump must be easy to dismantle and repair under shop conditions.
6. The installed cost of the pump should be as low as possible consistent with maintenance requirements and reliability.

How It's Built

The pump which evolved, shown in Fig. 1, is basically a vertical centrifugal pump with an integral electric drive. Here the pump is mounted in a piping run. The pump case is designed to withstand piping stresses so that the pump may be installed without a baseplate or concrete foundation.

Fig. 2 shows another of the standard pumps installed in a congested process area. Here again, the pump is supported by the piping and no foundation is used.

Electrical. Since the drivers are integral with the pumps, all of the standard units are equipped with a plug-type electric-power and grounding connection for quick removal. A safety interlock turns off the power in case the plug is removed when the circuit is hot.

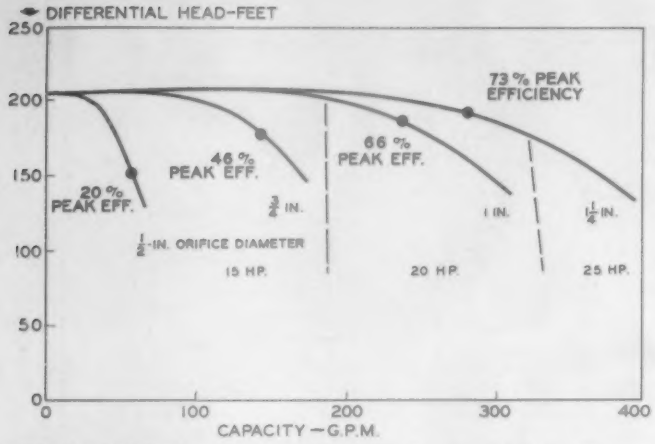
All motors use three-phase electric power and are connected in the shop so as to have standard phase rotation. All outlets are corrected to this phasing as they are installed so that replacement pumps will always rotate in proper direction.

Major pump parts. The seven parts of the pump are shown in the sectional drawing, Fig. 3. These are the case, cover, impeller, shaft, mechanical seal, sleeve, and orifice. All similar parts are dimensionally interchangeable between pumps. The pump is driven by an extended shaft motor. The shaft is protected from the process fluid by the impeller, impeller nut, and sleeve. This protection permits interchangeability of drivers between alloy and carbon-steel pumps.

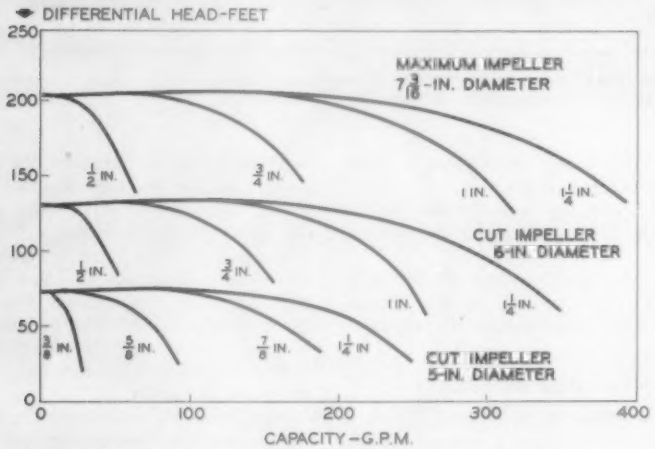
Because of the extended shaft, these drivers are not standard vertical motors. The cost, however, is comparable to that of horizontal motors of the same classification. Since the pump was designed for use with shop rather than field repair procedures, the advantages of close-coupled design could be realized without increasing maintenance costs due to limited accessibility.

The close-coupled design reduces the number of parts and improves ease of dismantling by eliminating the pump bearings, bearing bracket, lubricator, shaft coupling, and coupling guard, all of which are found on the conventional horizontal centrifugal pump. In addition, a more rigid shaft results than would be possible with a coupled shaft design of the same diameter and use of a smaller mechanical seal is permitted.

Since alloy construction is sometimes required for pumps in chemical-plant service, this pump was designed for ease of casting so that it could be economically built in any castable alloy and, as mentioned previously, the shaft is fully protected by the wetted parts so that special motors with



EFFECT OF ORIFICE on pump performance. All curves are for the same impeller. Horsepower requirements are based on specific gravity of fluid of 1.0. Fig. 4.



COMBINED EFFECT of orifice bore and impeller diameter. All curves are for one impeller pattern. Fig. 5.

alloy shafts would not be required.

The pump will provide a maximum head of 206 ft. at 125 g.p.m. Maximum capacity is about 390 g.p.m. at 135 ft. head. NPSH requirements vary from 4 ft. at 50 g.p.m. to 19 ft. at 390 g.p.m. On this basis, the pump meets the original requirements to cover the majority of our centrifugal-pump applications.

Orifice. The pump uses a plug-type discharge orifice to modify the performance of the basic unit. The orifice serves to eliminate the need for providing oversize drivers for lower capacity applications and to modify the head-capacity curves in Fig. 4. The upper curve represents the maximum available head. For full protection to the end of the curve, a 25-hp. driver would be required.

A 1-in.-diameter orifice limits the power requirements to 20 hp. and a ¾-in.-diameter orifice will limit the power requirement to 15 hp. For smaller impeller diameters the power requirements can be limited to 3 hp. As with other centrifugal pumps, the officiency drops off at lower flow rates. Low rate efficiencies can be improved through the selection of appropriate impeller patterns.

Since our electric-power costs are relatively low (0.7 cents per kw-hr.) we have been able to economically standardize upon one impeller pattern to minimize the number of spare parts.

The effect of impeller diameter and orifice bore on head and capacity performance characteristics is shown in Fig. 5. The pump is not limited to the curves shown. Intermediate impeller diameters or orifice bores may be used. Any performance point within the maximum capabilities can be approached by trimming the impeller, by reducing the orifice diameter, or by combination of both methods.

The particular combination selected depends on whether the objective is (1) limitation of maximum power requirement, (2) to obtain a particular slope of head-capacity curve, or (3) to obtain maximum efficiency. The smaller orifices provide "steeper" head-capacity curves which may be desirable for certain applications. Efficiency is higher for a given point if a larger orifice bore is used.

Field experience. The prototype was performance-tested at the factory during the latter part of 1957, and was installed in the plant for service tests in January 1958. Ten additional pumps were installed during the following 8 months. For test purposes, a cross-section of plant services was selected as shown in Table 1.

Early experience in process services showed that the motor was vulnerable to damage from vapors and liquids which leaked past the pump seal. Before design changes were made, a series of lower bearing failures was experienced, and three times the insulation on the motor windings failed due to chemical attack.

The following design changes appear to have eliminated this problem.

1. Ventilation ports were provided in the upper part of the pump case and in the lower part of the motor housing to permit vapors to escape. In the original design, the case was enclosed to confine fluid leakage to the drainage ports, but experience indicated that adequate ventilation of the upper case was of primary importance.

2. Teflon-sealed bearings were installed in the motor.

3. A drainage port from the back of the stationary seal face was provided as an outlet for fluids leaking past the seal faces.

TABLE 1—PLANT SERVICE TESTS FOR STANDARDIZED PUMPS

Installation number	Service—	Duty	Temperature
1	Intermediate process, fluid containing resin particles	Continuous	150° F.
2	Cooling-water circulation	Continuous	60° F.
3	Liquid petroleum gas with abrasive particles	Continuous	100° F.
4	Crude alcohol transfer	Intermittent	Ambient
5	Acetone column bottoms	Continuous	225° F.
6	Cooling-water circulation	Continuous	60° F.
7	Liquid petroleum gas	Continuous	100° F.
8	Cooling-water circulation	Continuous	60° F.
9	Lower layer from resin phase separator	Continuous	180° F.
10	Epichlorohydrin loading	Intermittent	Ambient
11	Allyl chloride loading	Intermittent	Ambient

New equipment upgrades refinery-waste treatment by activated-sludge process

Normal type or lagoon? Here are factors to help you decide

BY A. A. KALINSKE
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Tucson, Ariz.

TREATMENT of refinery wastes by aerobic biological decomposition has become quite common. Such treatment plants, designed particularly for removal of phenolic compounds, have been built by Imperial Oil of Canada at Sarnia, Ont.;[1] General Petroleum Co., Ferndale, Wash.;[2] Phillips Petroleum Corp., Okmulgee, Okla.; Great Northern Oil Co., St. Paul;[3] Texaco Inc., Anacortes, Wash.; and others.

All these installations use the activated-sludge process as it is called in sewage treatment. It has been shown by various engineering studies, and verified by field data, that the aerobic-decomposition process is frequently the most economical means, based on total cost, for destroying organic compounds which would pollute streams and ground water.

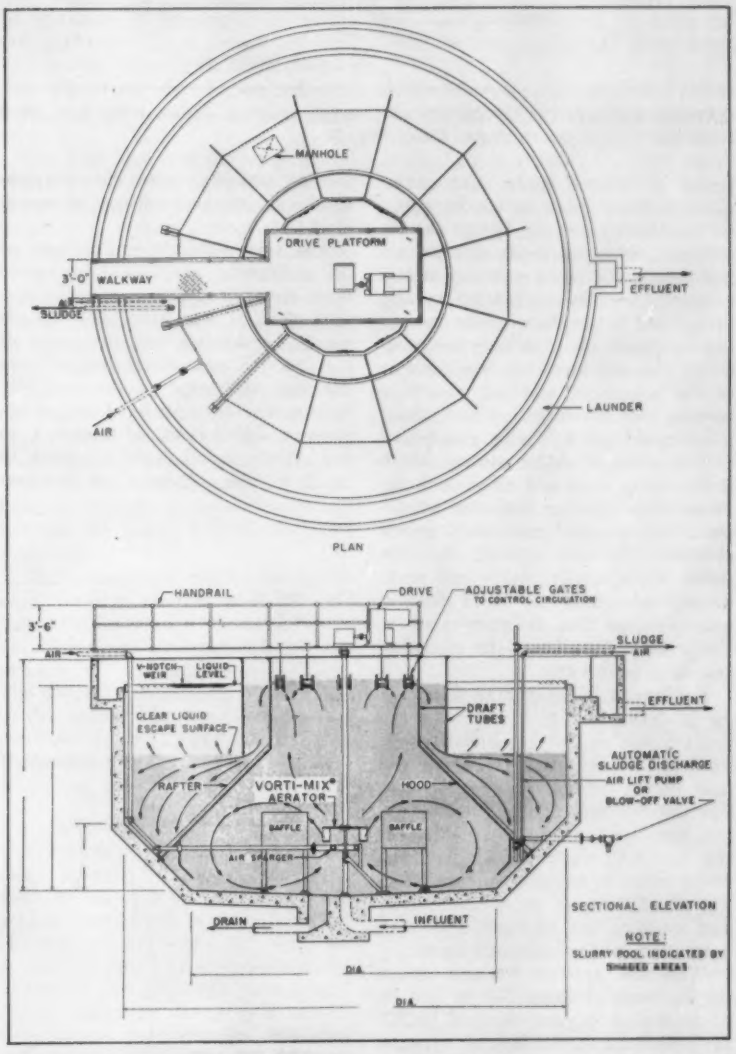
In the so-called activated-sludge process, a suspension of biological organisms, of diverse nature, is aerated and mixed with incoming wastes. The principal operating cost is the power required for dissolving the needed oxygen. The aerobic-decomposition process can be generalized and broadened to include processes involving various concentrations of biological organisms, and producing varying degrees of treatment.

It is quite in order to classify various aerobic-decomposition processes ranging from aerobic lagoons, which receive their oxygen supply by surface absorption, to the so-called high-grade activated-sludge process. The principal difference between these two processes, and all intermediate ones, is in the concentration of biological organisms maintained in suspension. In a lagoon, the biological life is of a relatively low concentration, 50 to 500 p.p.m., and is nonflocculent and dispersed. In a high-grade activated-sludge plant, the concentration of biological solids may be as high as 10,000 to 15,000 p.p.m.

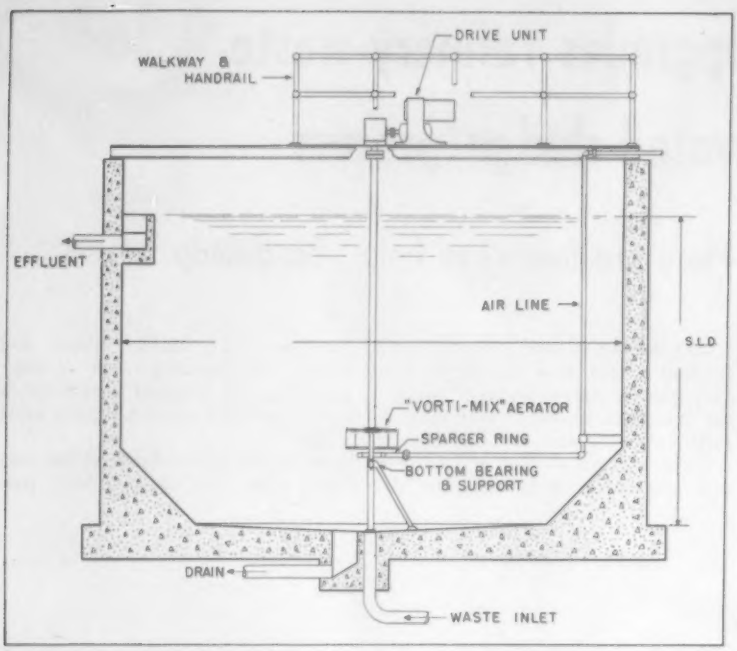
Paper presented at WPRA waste-disposal conference, Wichita, Kans., 1959.

The rate of aerobic oxidation and the rate of needed oxygen supply will vary with the concentration of biological organisms, assuming that flood is sufficient to maintain any specific concentration. Naturally, by using a high concentration of biological organisms, much smaller basins and shorter retention times can be used. However, the required equipment is much less elaborate for a process using a lagoon.

In recent years, the so-called activated-sludge process has been sub-



AERO-ACCELATOR TREATMENT UNIT is typical of equipment used in the completely leased activated-sludge process. Fig. 1.



OXYGEN ABSORPTION EFFICIENCY of a mechanical air disperser can be varied from low values up to about 25%. Fig. 2.

jected to intense study, and consequently much more is known about its functioning and the design factors involved, with the result that its use has been made more economical and efficient, and its application greatly broadened. Engineers are now designing equipment for practicing this process to suit and meet the requirements of the organisms, and not merely to comply with the engineers' ideas from a structural and hydraulic standpoint.

The activated-sludge system which is becoming more and more used, because of its inherent technical soundness, is a so-called completely mixed system.[4,5] In this system, the raw waste is dispersed quickly and completely throughout the entire mass of active sludge that is maintained in the process. This keeps the oxidation rate at a peak value.

Equipment for practicing this process is shown in Fig. 1. The most important part of this equipment is the mechanical air disperser, which not only breaks up the incoming air into fine bubbles and disperses it throughout the liquid mass, but also mixes the incoming waste quickly into the entire mass of organisms, thus feeding all of them at an optimum rate, and avoiding any localized high concentrations of the untreated waste.

With this system, we can design on the basis of about 200 to 300 lb. of biological oxygen demand (BOD) per thousand cubic feet of aeration volume per day, or about 55 lb. of phenol. This is four to five times the loading used in so-called old-style conventional activated-sludge treatment plants.

The oxygen-absorption efficiency of the mechanical aerator can be varied from very low values up to and above 25% (Fig. 2). The efficiency depends on the air loading and the speed of rotation. An economical design figure for this efficiency is 20 to 25%. Porous-type diffusers have oxygen-absorption efficiencies of about 5 to 8%. For a liquid depth of about 10 to 12 ft., this calculates out to about 2 to 2.5 lb. of oxygen per hour per horsepower.

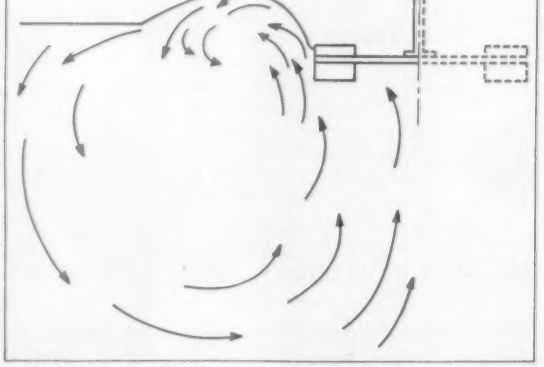
By using such turbine-type air dispersers, very high oxidation rates can be maintained. This permits the maintenance of high solids concentration, with the result that smaller aeration basins are possible.

Modified Activated Sludge

A lagoon, when properly designed, will maintain aerobic conditions throughout, except in the bottom slimes, and will receive its oxygen from the surface, or from algae which may thrive on the products of bacterial decomposition. Because the rate of oxygenation is slow, only a low bacterial concentration can be maintained, and therefore large liquid volumes and areas must be provided. The depths of such conventional-type lagoons must be shallow, about 3 to 5 ft., in order to insure aerobic conditions in the entire depth.

Since the necessary areas may not be available for conventional-type lagoons, especially for high BOD loads and flows, it is not always possible to take advantage of a lagoon-type treatment and its attendant low first cost and operating cost. Consideration has been given to supplying varying proportions of oxygen to such lagoons by mechanical means. What degree of treatment can be obtained in lagoon type of operation must be established by pilot-plant studies.

New lagoon system . . . At a recent installation made at a paper mill in Pennsylvania, pilot-plant studies indicated that a lagoon system having 4-day retention would give about 90% BOD reduction when treating a waste



VORTAIR aerator is used for service-type aeration. Fig. 3.

having a 5-day BOD of approximately 300 p.p.m. This consisted of four lagoons, each 600 by 120 ft. in area, and 12 ft. deep in series. The oxygen supplied was greatest in the first lagoon and gradually decreased in the following lagoons.

Three 60-hp. surface-type aerators were installed in the first lagoon (Fig. 3), each capable of supplying 150 lb. of oxygen per hour. In such relatively long-retention-time lagoons, even when artificially aerated, no solids return is practiced and there is no final clarification of the effluent. The bacterial growths are dispersed and nonflocculent, and when discharged with the effluent at the outlet end of the lagoon system, these suspended solids contribute relatively little to the BOD.

In order to further reduce the retention time in such lagoons, it is necessary to build up a biological solids concentration, which can be accomplished by practicing final clarification and return of the settled solids to the head end of the lagoon system. For example, it has been shown at the paper-mill installation that a 24-hour lagoon would have a solids concentration of 2,000 to 3,000 p.p.m. when fed with a 300 p.p.m. BOD waste, in order to produce a 90% reduction in such BOD.

In order to maintain such a relatively high organic solids concentration, it is necessary to provide auxiliary mixing in addition to that provided by the surface aerators. This is done by using relatively slow-speed mixers, located between the surface aerators, and such slow-speed mixers would not require a great deal of power expenditure, but would provide tremendous pumpage and turnover of the lagoon contents. The total power input would probably be of the order of 1 hp.-hr. for each 2 to 2.5 lb. of oxygen supplied.

Total oxidation system . . . Such a lagoon could be operated as a so-called total-oxidation system, since no solids would be wasted except those that went out with the effluent. Such a so-called total oxidation system has the advantage of eliminating sludge-disposal problems. The suspended biological solids, because of the long aeration period, are in a state of auto-oxidation and not in the active growth stage as they are in normal activated-sludge process, and consequently are relatively highly mineralized.

In fact, the volatile solids in such aeration basins would be of the order of only 30 to 40%, instead of about 80% as they are in a conventional-type activated-sludge treatment plant. Such treatment is quite similar to that practiced in small treatment plants now being built extensively for subdivision developments, motels, institutions, etc., which provides 18 to 30 hours' aeration for handling ordinary domestic sewage.

The advantages of using such modified or low-grade activated-sludge treatment in a so-called high-rate or aerated lagoon are: (1) low first cost if land area is available and relatively cheap, (2) minimum of mechanical equipment, (3) elimination of sludge-handling problems, (4) a more or less odor-free and fly-and-insect-free plant, and (5) little manual attention.

Aerators on platforms . . . The surface aerators can be installed on fixed platforms, if the water level is relatively constant. For routine maintenance, a light walkway can be provided, or a boat used. If the water level varies significantly, then the aerators must be installed on floating rafts, properly anchored. The agitation provided will prevent freezing in cold climates, and also keep the lagoon aerobic, even if a portion of it is ice-covered.

The particular aerator (Fig. 3) developed by Infilco consists of a specially designed turbine located adjacent to the water surface. It pumps up liquid from the bottom of the basin and discharges it radially at the surface, creating a peripheral hydraulic jump, which, due to the intense, fine-grained turbulence entrains large quantities of air.

Variable speed can be provided to adjust the oxygen input to the particular load, and thus save power when high oxygenation rates are not required. An earthen bottom is satisfactory, though it is advisable to stabilize the banks, such as by using stone riprap.

The horsepower requirements for such surface aerators can be estimated on the basis of about 2.5-3 lb. of oxygen per horsepower-hour, depending on the liquid temperature. The oxygen requirements for any particular waste can be calculated on the basis of the 20-day BOD, which is about 1.5 times that of the 5-day BOD.

Summary and Conclusions

The so-called activated-sludge treatment process has been extensively used to biologically oxidize various organic compounds, such as phenols, in refinery waste waters. Recent process and equipment developments make it possible to utilize this process and design equipment for it in a technically sound manner. The so-called completely mixed system for this process has greatly increased its efficiency and permitted BOD loadings four to five times those formerly used in the so-called conventional process.

The use of turbine-type mechanical aerators, which disperse and mix compressed air into the liquid mass, permits obtaining oxygen absorption efficiencies of the order of 20 to 25%, as compared to 5 to 8% obtained with porous diffusers.

Modification of the activated-sludge process by utilizing aerated lagoons may provide the necessary treatment with relatively low initial investment. Conventional lagoons usually have 30 to 60 days' retention when treating domestic sewage. By use of artificial aeration, such as with easily installed mechanical surface aerators, such lagoon treatment could be practiced with only, for instance, a 4-day retention time. Pilot-plant studies would, of course, have to be made to establish exactly what degree of treatment could be obtained in any given time.

Solids return . . . By practicing solids return from a clarifier following such aerated lagoons, a low-grade activated sludge, or total-oxidation-type treatment, could be practiced with retention time of, say, 1 day for a waste of 200 to 300 p.p.m. of 5-day BOD.

Such lagoons can be aerated with specially designed surface aerators of the turbine type located at the liquid surface, and installed on fixed platforms or floating rafts. Such surface aerators are highly efficient and provide about 3 lb. of oxygen per horsepower-hour, and due to the mixing action that they provide it is possible to use liquid depths of 10 ft. and greater.

Whether normal-type activated-sludge treatment or lagoon-type treatment should be considered depends upon the strength of the waste, results desired, land available, and proper evaluation of first costs and operating costs.

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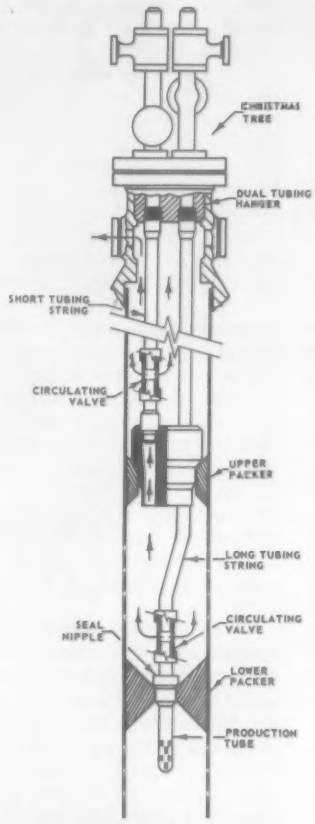
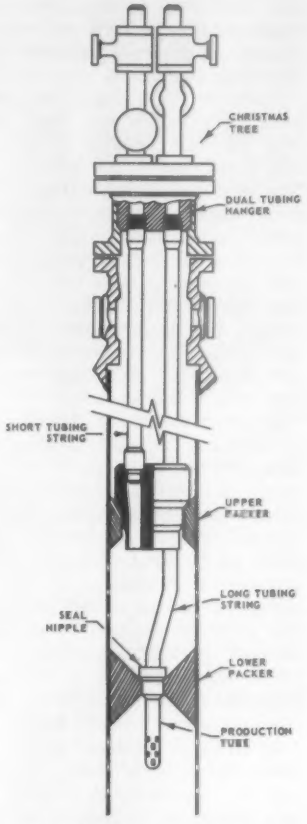
How to wash out multiple tubing-string wells

There are limitations on the special equipment used in multistring wells, and techniques of mud displacement must be varied to meet the peculiar requirements of a given installation. This article shows how to select the best methods to use in multizone wells.



MULTISTRING displacement with circulating valves. Valve is located between the packers. Fig. 1.



SIMULTANEOUS manipulation is gaining acceptance as another method of displacement. Fig. 2.

THE NUMBER of new multistring wells will certainly increase in the future, and a large number of old wells which now produce from only one zone will surely be recompleted as multiple producers with two or more tubing strings.

Because of this continuing trend to multiple completions, it is important to understand the various completion practices now in use and to realize the limitations of the equipment unique to multistring wells.

Multiple wellhead equipment can be classified into two general types. One type is designed to work through blowout preventers with complete pressure control; the other type is not. With the first type it is possible to run, suspend, and pack off the tubing strings before the preventers are removed. Most dual tubing string wells and practically all of the triple and quadruple string wells use this type of equipment.

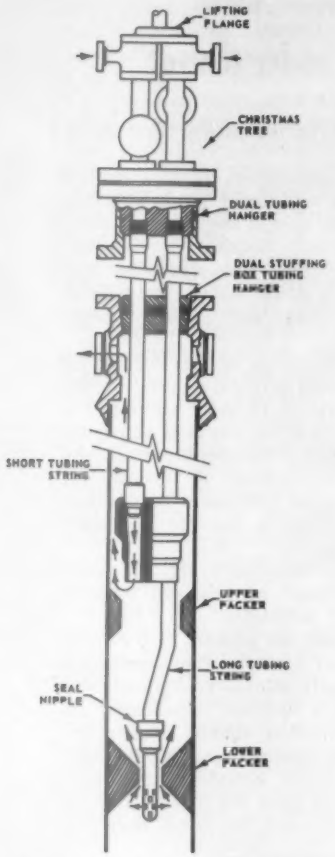
The second type of wellhead assembly uses simpler equipment for low-pressure or pumping wells. This wellhead usually consists of a tubinghead adapter with slip or mandrel suspension for the tubing strings. Connections for preventers are sometimes provided so that the second (or third) string can be run with preventer protection, but quite frequently the tubing strings are run with no conventional control equipment. One manufacturer produces a dual stripper rubber which is used when running or pulling the tubing.

Packers. There is a big reason for using parallel tubing strings for production, rather than one tubing string and the casing annulus. Two strings keep both high-pressure and corrosive fluids away from the casing. In dual parallel completions, to separate the upper-zone production from the casing, it is common to set an upper packer in addition to the lower one, although there are still cases in which only one packer is used.

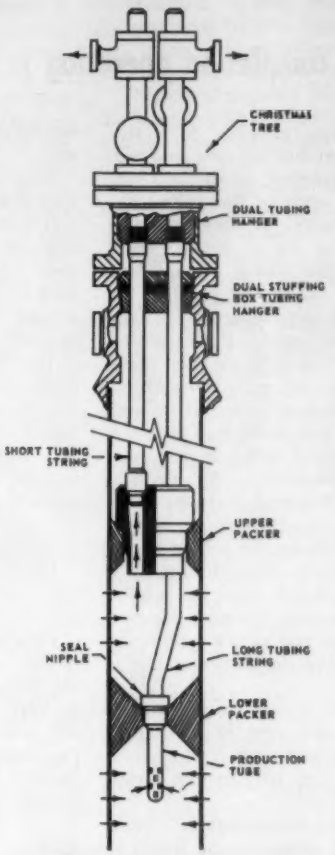
There are a variety of packers designed for, or which can be adapted to, multiple-string wells. They are in two broad categories: (1) permanent (drillable) and (2) retrievable packers. Where two or more packers are required, permanent and retrievable packers can be used in combination, if desired.

One point to consider in landing tubing in a packer is the effect of external forces on the stress in the tubing string. Assume that tubing weight is slacked off on the packer in order to maintain the annulus seal. Then, an increase in the tubing length

This article is taken from a paper titled, "Methods of Displacement in Multiple Tubing String Wells," presented at 1959 ASME Petroleum Mechanical Conference, Houston.



DUAL stuffing-box tubing hanger is wrapped around both tubing strings and seated in the bowl of the wellhead body. Fig. 3.



DUAL-STRING installations after displacement show final alignment of tubing hangers. Fig. 4.

can be caused by an increase in temperature or by a decrease in the pressure differential between tubing i.d. and casing annulus.

This increased length adds to the compression load on the tubing string. The compressive stress can cause the string to buckle, leading to interference with the other strings and preventing passage of tools within the tubing. Compressive stresses also lead to tubing-joint leaks.

Use of mechanical holddowns to anchor the tubing string within the packer may cause the other extreme. Assume the tubing is suspended in tension by a mechanical anchor. A decrease in temperature or an increase in the pressure differential between tubing i.d. and casing annulus will add to the tensile load. This could conceivably cause the tubing to part by exceeding the joint strength.

Displacement Methods

A primary difference in single and multiple-tubing completions is the method of displacing mud within the tubing string after the tubing has been suspended within the wellhead and a means of pressure control installed.

Single-string displacement. With a single tubing string, the tubing is ordinarily run through blowout preventers mounted on the tubing spool. After running, the tubing string is spaced out so that the seal nipple is properly located within the packer.

A stuffing-box top of tubing hanger is made up on the last tubing joint and lowered through the blowout preventers until the tubing hanger reaches its seat in the tubing spool. The landing joint is retrieved, leaving the tubing supported by a coupling resting on the tubing hanger.

The blowout preventers are then removed, the tubing string picked up, and a christmas tree made up on the male thread of the tubing after the coupling is removed. The christmas tree and tubing string can be picked up sufficiently for the seal nipple at the lower end of the tubing string to be disengaged from the packer bore.

Water or oil is pumped down the tubing string to displace the heavier mud which is circulated up the annulus between the casing and tubing and out the tubing-spool outlet. The stuffing-box tubing hanger which seals between the tubing spool and the tubing is designed so that the tubing can be moved through it while still maintaining a pressure seal.

After mud is displaced with lighter fluid, the christmas tree and tubing are lowered until the tree can be bolted to the uppermost flange of the tubing spool. Since the tubing string has previously been spaced out, the seal nipple is simultaneously positioned properly within the packer bore.

Formation pressure is often sufficient to overcome the hydrostatic head of the column of water or oil within the tubing and the well starts producing. The christmas tree, having been previously installed, provides control of well pressure.

Multiple displacement. This completion method with slight variations has been used for years for single-tubing-string wells where a packer is used. Requirements are the same for displacing on all multistring installations; however, because of the space limitation, the procedure is somewhat more involved.

There are several displacement methods currently used for multiple-string completions. Since the wellhead equipment, packers, and accessory downhole equipment, in some instances, limit the displacement methods which can be used, these points should be considered in prewell planning and equipment specification.

Swabbing. After the two tubing strings have been suspended and the control equipment (christmas tree) installed, the mud in the tubing strings can be removed by a wire-line-operated swab. The swab and a sinker bar are lowered through the tubing and then pulled out, thus bailing out the fluid above. Number of trips required to sufficiently lighten the hydrostatic head of the mud depends on weight of the mud, depth of the well, and pressure of the formation.

There is always a possibility of the swab getting stuck at some restriction within the tubing string, thereby causing delay in the completion.

Because of the time required and other factors, swabbing is not ordinarily used for displacement in deeper wells.

Circulating valves. Wire-line circulating valves run on the tubing string

"Advantage of method is that entire completion operation is under control."

permit displacement of mud within the tubing string with complete pressure control. There are several different ways that circulating valves can be used.

In a two-packer well, a circulating valve can be run into the well between the packers on the long tubing string as shown in Fig. 1. After the short string is set and the christmas tree is installed, mud can be displaced by pumping down the long string, out the sleeve valve, and up the short tubing string. When displacement is complete, the valve is closed by a tool run on a light wire line.

A variation of the above method is use of two sleeve valves: one on the long tubing string between packers; the other on the short tubing string above the upper packer. This arrangement permits displacing the mud within the casing annulus with water or oil.

Having water or oil in the annulus is sometimes desirable to help prevent corrosion of the casing or to ease the removing of tubing or packers at a later date.

Sleeve calves, like every other piece of equipment run into a hole, are a calculated risk and are subject to failure. More often than not, however, the equipment works just as it was designed to work (particularly when conditions are those for which it was designed).

Tubing-String Manipulation

As pointed out previously, in single completions made with a packer, it is common to disengage the seal nipple from the packer by picking up the tubing and circulating after suitable surface control equipment has been installed. With multizone completions, this basic principle is practiced even though the procedure is more complicated.

Individual manipulation. During individual tubing-string manipulation, the long tubing string is usually displaced after it is run into the well but before it is suspended in the tubing head.

If the production tube below the packer seal nipple is short enough, communication with the lower formation is prevented by a spring-loaded flapper valve (or some other type back-pressure valve) in the lower packer. When the seal nipple and production tube are withdrawn to circulate, the valve automatically closes, isolating the lower-zone production from the casing annulus. After displacing, the production tube and seal nipple are lowered down into the packer bore, opening the valve.

Pressure control at the surface is provided either by a back-pressure valve within the tubing, by a tubing hanger, or by the master valve of the christmas tree, depending on the type of equipment used. Back-pressure valves allow fluid to be pumped down the tubing bore but prevent backflow. These valves can be removed through the christmas tree under well pressure.

After the long string is run, displaced and suspended, the identical procedure is followed with the short tubing string. Again pressure is controlled by attaching the tubing to the christmas tree or through use of a back-pressure valve. After the mud is displaced, the tubing string is lowered to position the seal nipple within the packer bore, and the christmas tree is installed.

If formation pressure is not sufficient to bring the zone in even after replacing the mud with lighter fluid, the fluid column will require swabbing or the like.

Simultaneous manipulation. Another method of displacement which is gaining acceptance is simultaneous manipulation. After both tubing strings have been run, spaced, suspended, and the christmas tree installed, the lowermost flange of the wellhead body is unbolted as shown in Fig. 2. A lifting flange is attached to the top portion of the tree and both tubing strings, together with the tree, are picked up far enough to withdraw the seal nipples from the packers.

After lifting the tubing spool and tree, a dual stuffing-box type of tubing hanger is wrapped around both tubing strings and seated in the bowl of the wellhead body (Fig. 3). The annulus around the tubing strings is sealed by the stuffing-box hanger packing which is actuated by anchor screws in the wellhead body upper flange.

With both tubing seal nipples clear of the packers and the casing annulus sealed, water or oil can be pumped through the tree, down the tubing string, up the casing annulus, and out through the outlet of the wellhead body. After displacement, the christmas tree and the attached tubing strings are lowered until the tubing spool flange can be bolted into position (Fig. 4). Simultaneously, the seal nipples enter the packer bores downhole.

First applications of this method used ram-type tubing heads with dual port rams to seal the annulus during displacement. Because of the relatively high cost of the ram heads, they have been almost entirely replaced by simpler dual stuffing-box tubing hangers.

The advantage of this method of displacement is that the entire completion operation is under control. The tubing strings are run and suspended with complete blowout-preventer protection. Circulation is through the christmas tree with one or more valves for protection in case the well starts producing.

On the other hand, this procedure uses wellhead material not required for other techniques.

Hydraulic set packers. Still another method of multiple displacement are the recently introduced hydraulic set packers. A foremost requirement for any completion method is complete protection against blowouts. Hydraulic packers offer controlled multistring completion from the time of running the tubing until the zones start producing.

Chief difference between this method and others is that it is not necessary to pick up the tubing strings in order to displace; the packers are not set until the mud is circulated out of the tubing strings. Then, each packer is set when required by hydraulic pressure from the surface.

There are several different methods for setting hydraulic packers. One was is to pump a plug down the tubing until it seats in the packer. Additional pressure within the tubing creates a differential across the packer causing it to set. The plug can be retrieved with a wire line.

If a ball is used instead of a plug, it can be flowed or swabbed out of the tubing.

One type of plug is pumped through the packer to bottom after the packer is set. If there is more than one packer, each can be set selectively.

As good for 3 as for 2. The above displacement methods are those in most common use at present. Although the procedures and illustrations deal mainly with two strings of tubing, displacement methods would be equally applicable to wells with three or four tubing strings.

Wellhead equipment for simultane-

ous manipulation of three tubing strings has already been developed; it would be relatively simple to design comparable equipment for four strings of tubing if it is not already a reality. The equipment used when displacing by swabbing or by circulating valves is the same regardless of the number of tubing strings in the well.

Quadruple tubing string wells on which information is available have either been swabbed in or have displaced mud by circulating after the christmas tree was installed. This was done with hydraulic set packers.

Design limitations. In the short time that parallel completions have been widely used, there has been a trend toward increasing the size or number of the tubing strings and decreasing the size of the casing in which they are run. This trend follows the economy concept of multistring completions. However, as the trend continues, it places severe limitations on the design and manufacture of packers, wellhead equipment, christmas-tree valves, etc. Because of space limitation, some features of comparable single-string equipment have been sacrificed. Stresses are higher and, in general, the equipment requires much more care in installing to avoid damage.

For example, consider a typical wellhead installation. One conventional tubular program is two strings of 2⅜-in.-o.d. tubing within 7-in. casing. Most wellhead manufacturers provide a 6-in. nominal tubing head and dual tubing hanger to accommodate this combination. A 6-in. nominal tubing hanger must be less than 7 1/16-in. o.d. in order to pass through a standard 6-in. blowout preventer.

The body member which supports the dual tubing hanger must have a 6⅜-in. minimum bore to be full opening for the casing.

Since, in a normal completion cycle, tubing couplings are passed through the hanger, it is necessary to provide within the hanger two ports, each larger than 3 1/16-in. making a minimum of 6⅛-in. port diameter within the 7-in.-diameter hanger.

In addition to clearance for the tubing strings and collars, some types of tubing hangers provide for passage of side-pocket gas-lift valves and similar tools. Other requirements are to support the tubing hanger within the tubing spool body, to furnish a locator mechanism for orienting the tubing ports with respect to the tubing spool, and to seal the annulus by means of a packing unit.

With two long tubing strings and the possibility of an additive pressure load applied on top of the tubing hanger (in the event of a tubing bore seal failure), it is obvious that the capacity limit for hangers of this size is rapidly being reached. Wellhead design is limited between a fixed area for supporting the tubing strings and increasing tubing and pressure loads.

The problem of diminishing design area is not confined to wellhead products alone but affects christmas-tree valves, packers, gas-lift valves, and other completion tools. Service companies have had difficulties attaching their lubricators to the top of high-pressure dual christmas trees because of the dimensions dictated by current practices.

Recommended for new wells. In spite of the dimensional demands made on it, the present multistring equipment has proved adequate in initial installation. What is not fully determined is whether future workover programs can be carried out without delays caused by malfunctioning equipment.

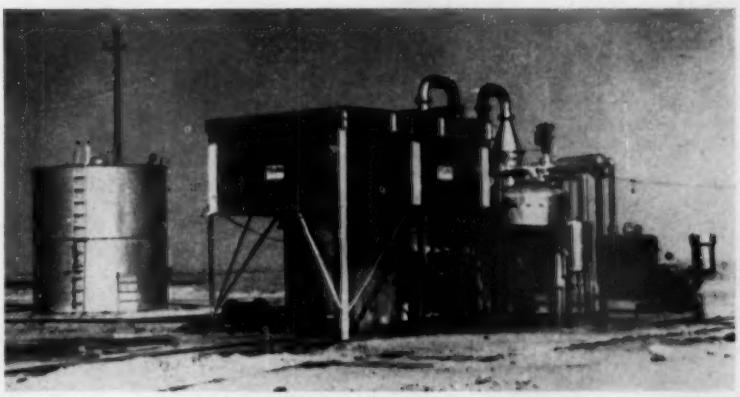
Better equipment (valves, wellheads, packers, etc.) could be furnished if larger casing were run than that currently being used. Of course, this would increase the cost of new wells and is impossible in old wells recompleted as duals. So, it is not likely that this practice will become popular.

There is a less expensive alternate. Two or three joints of larger casing could be run at the top of the oil string. This would greatly ease the design problems on the wellheads and christmas-tree valves even though the space limitations on packers and other downhole equipment would be unchanged.

Such a solution would only slightly increase the well cost. Trouble-free completions and workovers as regards the wellhead and christmas-tree equipment would more than offset the added expense.

New unit provides water for Aminoil refinery

IN THE Neutral Zone between Kuwait and Saudi Arabia all ground water is contaminated with oil and brackish elements, and all drinking water has been imported. To overcome this severely contaminated-water situation, a submerged-combustion unit and an air-cooled horizontal-core steam condenser now provide 25,000 gal. of pure drinking water daily for personnel of Aminoil refinery.



Burning an extremely high-temperature flame under water evaporates the oil-contaminated water and forms a gas-steam combination. This gaseous mixture flows into a separator where some contaminants are removed. The mixture then flows into the cooler where 97% of the water vapor is condensed and the air and other gases still in the cooler are cooled from 80° to 138° F., depending upon the ambient temperature.

The steam, water, and gas mixture then goes through a water separator where the water is removed and the gases discharged into the atmosphere. Every 10 days the unit is shut down to service internal-combustion engines. Other than this, continuous operation is provided with no difficulty.

Water supplied with current methods is of better quality than that previously imported to the refinery.

The plant was designed and installed by Submerged Combustion, Inc., Hammond, Ind., and manufactured in connection with the Young Radiator Co., Racine, Wis.

The
FOREMAN'S PAGE

Pressure in stationary fluids

THE TERM fluid is used to designate both liquids and gases. Liquids and gases have many similar properties. They are alike because both are very active or movable. In fact they are so active or free to move that a liquid or gas does not have any definite shape. They take the shape of the vessel that contains them.

Force, Weight, Pressure

In studying liquids and gases we must discuss the difference between the terms force, weight, and pressure. Force means a push or pull. Weight means heaviness. Pressure means the push or pull or weight per unit area of the surface acted upon. Pressure can be defined as:

$$\text{Pressure} = \frac{\text{(Force)}}{\text{area acted upon}}$$

To help understand the difference between weight and pressure, suppose we have three blocks lying on a table top. Each block weighs exactly the same amount. However, the pressure produced on the table top by the blocks depends on the way the block is placed on the table top or the shape of the block.

In Fig. 1 the block weighing 10 lb. would exert a pressure of 5 psi. (pounds per square inch) and in Fig. 2 the same 10-lb. block would exert a pressure of 10 psi. The 10-lb. block in Fig. 3 would exert a pressure of:

$$\frac{10}{\frac{1}{2} \times \frac{1}{2}} = \frac{10}{\frac{1}{4}} = 40 \text{ psi.}$$

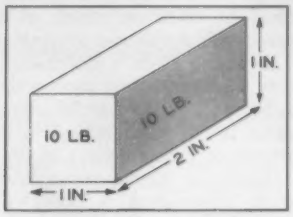


FIG. 1.

PRESSURE produced on the table top by the block depends on the way the block is placed. This block exerts a pressure of 5 psi.

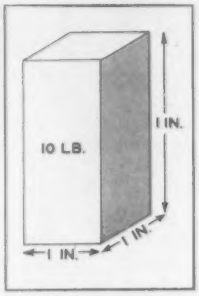


FIG. 2.

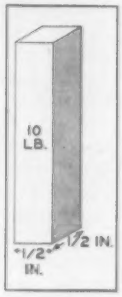


FIG. 3.

BOTH of these blocks weigh the same but they exert different pressures because they act on different areas. The first block exerts 10 psi. while the second exerts 40 psi.

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Oil Co.

These test questions are based on the first two articles in this series. The first part ran in the November 23 issue of OGJ, and the second part in the December 14 issue.

Please place a check (✓) mark opposite the correct answer.

1. Temperature is
   - .... (a) The same as heat.
   - .... (b) A measure of hotness or coldness.
   - .... (c) A thermometer.

2. Latent heat is
   - .... (a) Heat necessary for a material to change state.
   - .... (b) Not usually as large as sensible heat.
   - .... (c) Measured by a thermometer.

3. Heat is
   - .... (a) A measure of hotness or coldness.
   - .... (b) A form of energy.
   - .... (c) The same as temperature.

4. Sensible heat is
   - .... (a) Heat which changes the temperature of an object.
   - .... (b) Heat necessary to change a liquid to a vapor.
   - .... (c) The condition of being hot or cold.

5. Thermal expansion of a liquid
   - .... (a) Will not happen except at temperatures over 500° F.
   - .... (b) Cannot take place in a closed tight space if trapped.
   - .... (c) Can create very high pressures in equipment.

6. If we boil water, the vapor leaving the surface of the boiling liquid
   - .... (a) Has the same temperature as the liquid.
   - .... (b) Is hotter than the liquid.
   - .... (c) Is colder than the liquid.

7. One pound of steam at 212° F. has
   - .... (a) Less heat than a pound of water at 212° F.
   - .... (b) The same amount of heat as a pound of water at 212° F.
   - .... (c) More heat than a pound of water at 212° F.

8. To raise the temperature of a quantity of water from 100° F. to 150° F. will require
   - .... (a) Sensible heat.
   - .... (b) Latent heat.
   - .... (c) Heat of fusion.

9. To heat up most liquid hydrocarbons
   - .... (a) Requires more heat than heating up the same weight of water.
   - .... (b) Requires less heat than heating up the same weight of water.
   - .... (c) Requires the same amount of heat as heating up the same weight of water.

10. To raise the temperature of 8 lb. of water from 50° F. to 150° F. will require
    - .... (a) 800 B.t.u.
    - .... (b) 1,500 B.t.u.
    - .... (c) 1,000 B.t.u.

Answers

1.—b	6.—a
2.—a	7.—c
3.—b	8.—a
4.—a	9.—b
5.—c	10.—a

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

New American tanker rates

We notice tanker rates being stated as ATR. What are these rates and how are they related to the USMC rates? G.A.H.

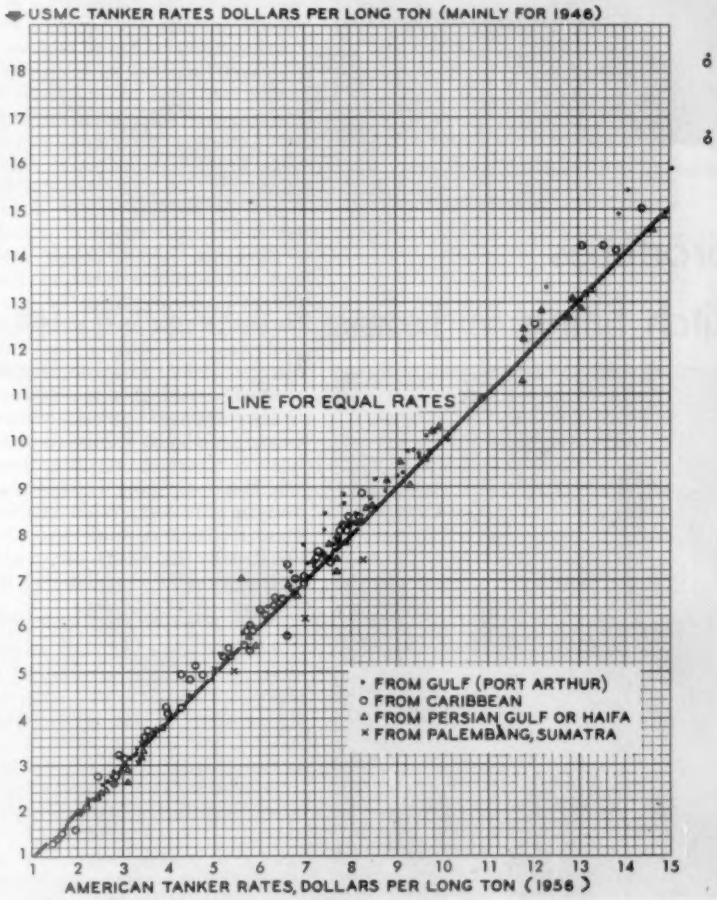
In 1956 the Association of Ship Brokers and Agents (8-10 Bridge Street, New York 4) issued its American Tanker Rate Schedule (ATR) which revises and corrects the older United States Maritime Commission (USMC) rates which were published in 1946 (and 1948). The new ATR rates are based on the more modern T-2 type of tanker rather than the old standard (approximately 12,300-d.w. ton) type of tanker used by the USMC.

"This rate study was not an attempt to determine profit for either Owner or Charterer, and accordingly, the USMC rate of $2.85, Port Arthur-New York, was used as a basis for the earning capacity of our standard tanker, with the theoretical goal that no matter where the vessel trades throughout the world its return per day should be similar to the return per day on this basic Port Arthur-New York run. A T-2 SE A1 tanker of 16,000 TSDW on an average service speed of 14.25 knots on 285 barrels of fuel oil per day has been used as a basis for our calculations. To simplify and yet make more practical the working of these rates, the canal factor has been incorporated, similar to the London Scale, to be added to the final rate after allowing for the premium to be added or subtracted to the basic rate. Additionally, governmental and other variable localized charges have been omitted from our calculations."

The new rates are compared with USMC rates in Fig. 1. Costs of fuel, labor, and tankers have increased since 1946, but larger more efficient vessels have tended to keep costs down. The fact that the 1956 American Tanker Rates are somewhat the same as the 1946 USMC rates should not be interpreted to mean that the actual costs at these dates are equal. The averages of the new standard rates are slightly lower than the older USMC rates especially for long hauls. USMC rates include canal tolls whereas the new rates do not (90 cents Panama and 85 cents Suez).

From a practical standpoint it is fortunate that the new rates are substantially the same as the older USMC rates because percentages above and below the standard rates are nearly the same whether based on ATR or USMC.

The only other widely used rating systems are the old MOT (British Ministry of Transport) and SCALE (London Market Tanker Nominal Freight Scale, November 1952) rates. The relationship of these to USMC rates was discussed on this page in the issue of August 20, 1956.


USMC TANKER RATES DOLLARS PER LONG TON (MAINLY FOR 1946)
LINE FOR EQUAL RATES
• FROM GULF (PORT ARTHUR)
○ FROM CARIBBEAN
△ FROM PERSIAN GULF OR HAIFA
× FROM PALEMBANG, SUMATRA
AMERICAN TANKER RATES, DOLLARS PER LONG TON (1956)

APPROXIMATE RELATIONSHIP between USMC and ATR standard rates. Fig. 1.

Handling viscous crudes

Is Table 1 of "How to Handle Viscous Crude Oils," November 15, 1954, p. 269, correct? It seems that heavier oils would require more temperature to handle than thinner oils? C.S.

Your statement, of course, is correct. However, the viscosities shown in the column headings of Table 1 are not the viscosities of the crude oils at some standard temperature but are viscosities at the handling temperature. Thus, a viscous oil must be heated to a higher temperature than a thin oil in order to reduce its viscosity to the viscosity required for easy (or economical) handling. In Table 1 the "at 100° F." should be removed from the column headings.

SHEEPSFOOT is pulled along ditch to compact backfill to avoid settling and cracking at pipeline road crossings.

New slim roller produces compact ditch filling in Texas

EXAMINING sheepsfoot are Carrington Mason, vice president of operations, Houston Natural Gas Corp.; R. T. Breidenbach, Texas Highway Department engineer; Lawrence Elling, Houston design engineer; and W. O. Hopfe, assistant superintendent of the Houston district for the gas company.

THE PROBLEM of compacting backfill at pipeline road crossings is one which commands increased attention as more lines are relocated because of highway construction.

One solution to the problem has been devised by personnel of Houston Natural Gas Corp. It is a special sheepsfoot roller based on the principal of the large machine used for compacting earth on highway and building projects. It is being used on rights-of-way involved with the interstate highway program.

Thus far, compaction has met the rigid requirements of the Texas Highway Department, which has been very pleased with results of the new tool. Generally speaking, highway-department requirements demand compaction equal to that of adjacent undisturbed soil.

It was at the urging of the highway department that Houston Natural several months ago started working on the problem. Texas Highway Department Engineer R. T. Breidenbach complained that he had been trying for 10 years to promote an improvement on existing methods of refilling ditches. The same plaint expressed numerous times before had failed to bear fruit. But this time he was speaking to the right people.

Lawrence Elling, design engineer, and Willie Hopfe, assistant Houston district superintendent of Houston Natural accepted the challenge. Their goal was to develop a tool to pack dirt sufficiently to avoid settling and eventual cracking of a roadway.

They examined previously used and existing methods. The track of a bulldozer is sometimes run over the backfill. Water tamping is also used, or tamping with compressed air. None of these methods is ideal, and all were rejected by Elling, Hopfe, and their colleagues who joined in the search.

Development of Sheepsfoot

The principle of the sheepsfoot roller, which packs earth with heavy steel spikes shaped ilke a sheep's foot, was selected as the most promising. A pilot machine was made of readily available materials in a company shop in Houston. The large rollers were made from sections of heavy pipe revolving on truck axles. Spikes were fashioned from lengths of small-diameter pipe welded onto the rollers.

Spikes were capped with metal discs welded on the end which comes in contact with the earth. (These have since been replaced with a standard

sheepsfoot commonly used on machinery for compacting dirt on road construction). The model was designed for a 15-in. width to fit into a 16-in. ditch.

The prototype was made of two rollers. A third was added later. For the necessary weight, one drum was filled with water, one with sand, and the third with heavy drilling mud.

The sheepsfoot was field-tested on construction in North Houston (as shown in the photographs) by Houston Natural and Golightly Construction Co. personnel.

It is hauled to the job site on a truck, lowered into the ditch, and attached on one end to the sidearm of a tractor or bulldozer. The sheepsfoot is pulled along the ditch until it reaches the end. Then the sidearm is attached to the roller on the other end to be pulled back for another pass.

To achieve uniform compaction, soil is spread and compacted in layers rather than all at one time. Soil need not be spread evenly in the ditch when using the Houston Natural sheepsfoot. Its design is such that the spikes spread the uneven mounds of dirt on the first pass. This is not true of some other earth-moving systems. Layers of dirt are spread and rolled until the ditch is filled. At that point the dirt should be packed so tightly that the sheepsfoot merely walks on the surface of the ground.

The sheepsfoot does the job once and for all. There is no need to haul in dirt after the backfill has settled. This feature of the sheepsfoot is considered a real money saver, justifying the time and effort put into its development.

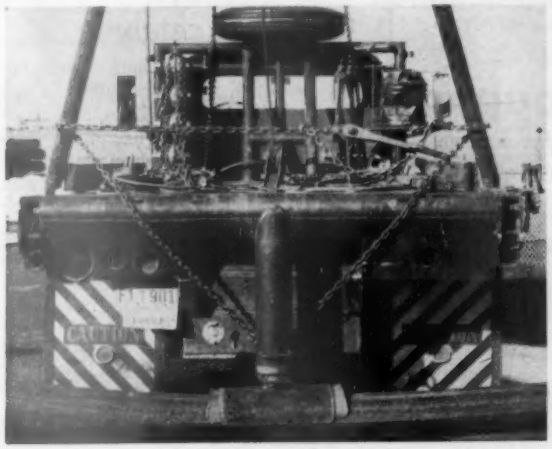
BENDING SHOE is attached to Great Lakes gang truck to form a bending machine for handling pipe up to 12-in. in diameter.

Portable bender saves money

BENDING used to be a major problem for maintenance gangs of Great Lakes Pipe Line Co. in areas where sideboom tractors with bending shoes were not readily available.

It was becoming a bigger problem as time went on and rerouting of lines was increasing because of the interstate highway program.

Then about 3 years ago the idea was conceived for a bending shoe to attach to the gang truck. Roy Cave, welder in the Sioux Falls tank crew, and Harold Shorb, oiler-station laborer at Falls City, adapted the principle used by the sideboom tractor to the gang truck.



VARYING-SIZE shoes may be attached to tractor which still is available for regular use.

The result has been a very useful and cost-saving addition to gang equipment. And for the two men who developed the equipment it has meant an award of $500, the largest in the 28-year history of Great Lake's suggestion plan.

The maintenance gang handles small construction and maintenance jobs, whereas major projects are contracted. In the latter case, the contractor of course has the necessary equipment.

On small jobs, b e f o r e the new equipment was developed, the gang would rent a sideboom tractor or use a winch line to bend against a nearby tree. The tractor was rented in Great Lakes southern area, where such equipment is readily available and therefore not too expensive. But in the northwestern and northern areas, it's hard to find and expensive as well. The nearest sources for the northwestern area are Kansas City and Minneapolis with rental cost running to $20 an hour, which is very expensive for equipment that is idle much of the time.

So in these areas the gang would bend pipe by affixing one end to a tree, hooking a winch line to the other end, and pulling against a second tree in between. The truck was made stationary by digging holes for the rear wheels. This method, unwieldy at best, also produced wrinkles and kinks on occasion.

If a couple of big trees weren't handy, the gang would go to its warehouse where pipe could be bent with a machine which used the legs on the pipe dock. This also was time consuming and not always satisfactory.

Cave and Shorb went to work to adapt the tractor-bending method to the gang truck. They came up with varying-size shoes which can be attached to the rear of the truck to bend pipe up to 12 in. in diameter, the largest on the Great Lakes system.

The gangs thus are able to make bends on the job site quickly and easily, and safer than with previous methods. The shoes are described as low in cost with a design permitting assembly in minutes.

The new e q u i p m e n t has been adopted by the northwestern and northern area gangs. Southern-area gangs continue to rent sideboom tractors because of their availability at reasonable cost.

▶▶▶ New Equipment Section

This week's SHOWCASE features . . .

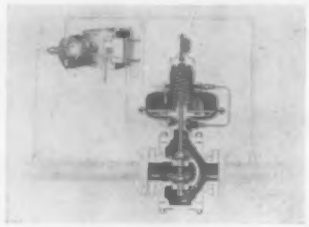
Drilling-mud weighing made easier

. . . through the development of a bulk-mud scale that totalizes and indicates on a dial the number of 100-lb. sacks of mud weighed. The bulk-mud scale installs easily. It requires no alteration or modification to existing bulk-mud tanks.

The scale adapts to 700 or 1,400-sack tanks. A recording indicator can be used to obtain a permanent record of all mud receipts and withdrawals. Delivery time: 2 weeks. Price: about $1,500 for a 700-sack tank scale and $2,400 for a 1,400-sack tank scale. Source: **Castagnos Co., Donaldsonville, La.**

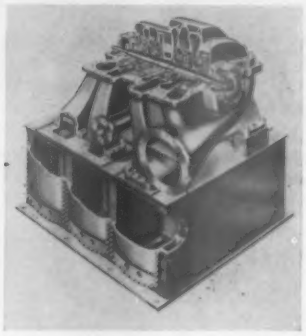
Gas regulators

. . . set remotely with this Series 606 Kixcel remote-control drive unit. Designed for use with pilot-operated gas regulators, the unit turns the pilot's adjusting screw either for an increase or decrease in the reduced pressure of a system.



The unit is controlled from a remote station by conventional telemetering equipment or by a d.c. control signal from a polarized signal transmitter. Features of the control include fast and easy manual adjustment, fully adjustable pressure limit switches, and various rates of pressure change. Delivery time: 3 weeks. Price: about $345 to $375. Source: **Fisher Governor Co., Box 307, Marshalltown, Iowa.**

●



Air supplied

. . . in large volume at 100 psi. by this H-line centrifugal air compressor. It comes with ratings from 1,000 to 8,000 b.hp. and with capacities from 5,000 to 38,000 c.f.m.

To provide high efficiency the machine has integral intercoolers between each stage of compression. It comes as a complete package. This includes the matching driver, intercoolers, and lubricating system.

Through the use of single-case construction and base mounting of the intercoolers, floor space is reduced as much as 40% over machines of comparable horsepower. Side connections are used to permit up or down piping and to eliminate space-consuming axial inlets. Source: **Clark Bros. Co., Olean, N. Y.**

●

One-step catalytic

. . . process for purification and dealkylation of aromatic light oils has been developed. The Litol process is available for general licensing. It is used for processing of aromatic light oils to obtain benzene, toluene, and xylene. Purified benzene obtained from the process typically contains less than 1 p.p.m. of thiophene and has a freezing point of 5.4° C. or higher.

The process reportedly eliminates the need for a second step involving either costly azeotropic distillation or solvent extraction. Source: **Houdry Process Corp., 1528 Walnut Street, Philadelphia 2.**

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number:.....

.....

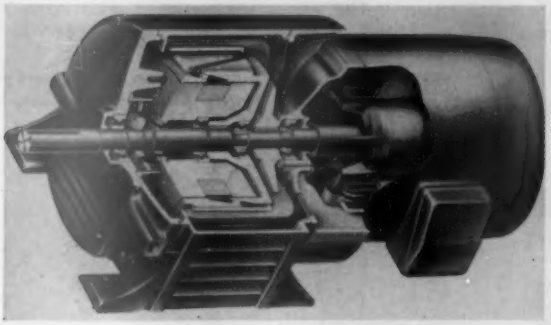
Described in OIL AND GAS JOURNAL - Issue of **December 21, 1959**

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

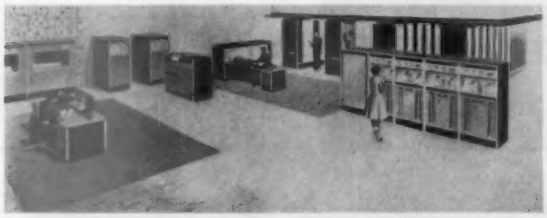


Equipment speed closely controlled

. . . with this new eddy-current-coupling adjustable-speed drive. It comes in ratings from 5 to 100 hp. The Kinatrol unit is designed for easy installation and startup.

The a.c. motor and eddy-current-coupling adjustable-speed member are integrally designed to give a compact unit. The unit has no rotating windings, brushes, or slip rings. The stationary field coil and tachometer generator coil are completely protected.

The control enclosure includes an exciter-regulator for coupling control, and may also include an a.c. motor starter and short-circuit protection. Source: **General Electric Co., Schenectady, N. Y.**



World's fastest electronic computer

. . . is the claim made for this new Univac Larc solid-state computer. It is a large-scale digital-computing system that can operate at speeds up to 200 times faster than older types of computers. As an example, it can perform 250,000 additions or subtractions of 12-digit decimal numbers a second.

One advantage is that both data processing and engineering problems can be performed concurrently by the computer. Magnetic core units store up to 97,500 words. The drums store up to 6,000,000 words. This storage capacity is supplemented by up to 40 magnetic tape servos. The processor operates independently on its own program. Price of the computer is about $6 million. It will rent for about $135,000 a month. Source: **Remington Rand Div. of Sperry Rand Corp., 315 Fourth Avenue, New York 10.**

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OUACHITA BANK BLDG.

MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

Electrical grounds

. . . located quickly with a new model of the Brunt Faultfinder. The instrument lets you locate electrical grounds without shutting down production. The new model weighs 18 lb., about 33% less than the original model. The double earphones have a foam-rubber covering to assist the

MACCO

TIME TESTED PRODUCTION EQUIPMENT

MACCO DIAPHRAGM MOTOR VALVES—

Type "DC" Motor Valve

The unique "DC" Valve has a built-in self-purging drip chamber to supply dry gas to diaphragm directly from the valve and eliminate external connections. This valve is normally used in gas service.

Type "S" Motor Valve and Type "A" Time Cycle Controller

The compact "S" ("Shorty") valve is similar to the "DC" but uses an external drip pot instead of built-in. This valve is ideal for oil and gas production service.

Both "DC" and "S" Motor Valves may be used for time, level and pressure control service. For further information, write for Brochure Nos. 8-02 and 16-01.

MACCO

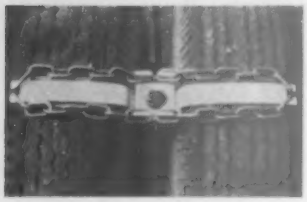
OIL TOOL COMPANY, INC.

1521 Prince P.O. Box 7288 Houston 8, Texas

Phone UN 1-1253

operator in hearing loud and clear signals.

The instrument can be used to locate grounds on power systems, both a.c. and d.c., up to 600 volts while the system is energized. It imposes only 2 amp. on the circuit. One man can easily operate it. Available from stock, it sells for about $450 to $550. Source: **Parr Mfg. Corp., 44 Austin Street, Newark, N. J.**



Truck-wheel spinning

. . . overcome with a new device, called a traction assembly, that is designed to bring trucks through snow, ice, mud, or other adverse surface conditions. It consists of easily applied spring-steel plates that flex with the tires to provide safe yet vibrationless operation at normal speed.

Truck drivers can equip their trucks in a few minutes with the Trac-Plates to connectors permanently mounted in the spacer between the dual wheels. The plates are equipped with cross-links by hand. No tools are needed. Price of the device is about $75 for a set of six units. Source: **Tractioneer Co., 410 North Michigan Avenue, Chicago 11.**

Continuous process control obtained

. . . with this chromatograph-pneumatic combination. It stores peak values from a process chromatograph and uses these values as the basis for process control until the next peak value is supplied.

This type of stream analyzer detects a deviation in final product purity and takes self-corrective steps to bring the process back in line. Thus, it offers closed-loop operation for completely automated plants. It includes a CEC Type 26-202 process chromatograph and a Taylor EMF-air transducer. Delivery time: about 60 days. Source: **Consolidated Electrodynamics Corp., 360 Sierra Madre Villa, Pasadena, Calif.**

ODEX transistorized control systems mean

Now a completely transistorized control system for your lease automation project. Local and remote stations made up of fully transistorized equipment using Micro-wave, telephone lines, or existing service lines as carriers. Combine this with the "solid state components" . . . no mechanical parts to wear out . . . and you have absolute "trouble-free" control over your lease operation. Control that enables you to pin-point trouble, determine the cause, and dispatch the proper repairman immediately. No wasted time in machines or men.

CHECK THESE ADDITIONAL FEATURES:

A. HIGH SPEED scanning and switching.
B CONTINOUS SCANNING of alarms and control points.
C. HIGH SPEED AUTOMATIC correction of false signals.
D. LOW POWER CONSUMPTION with storage batteries for stand-by power.

Just a few reasons why transistorized control means REAL AUTOMATION.

ODEX ENGINEERING CO.
1410 N. Grant, Odessa, Texas
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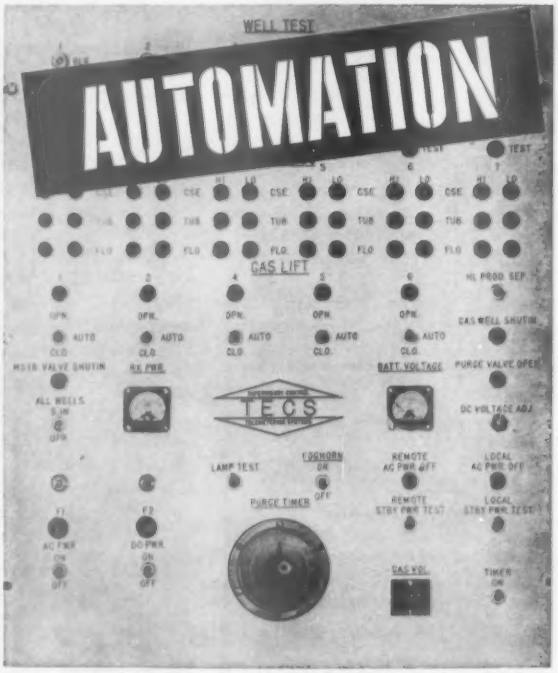
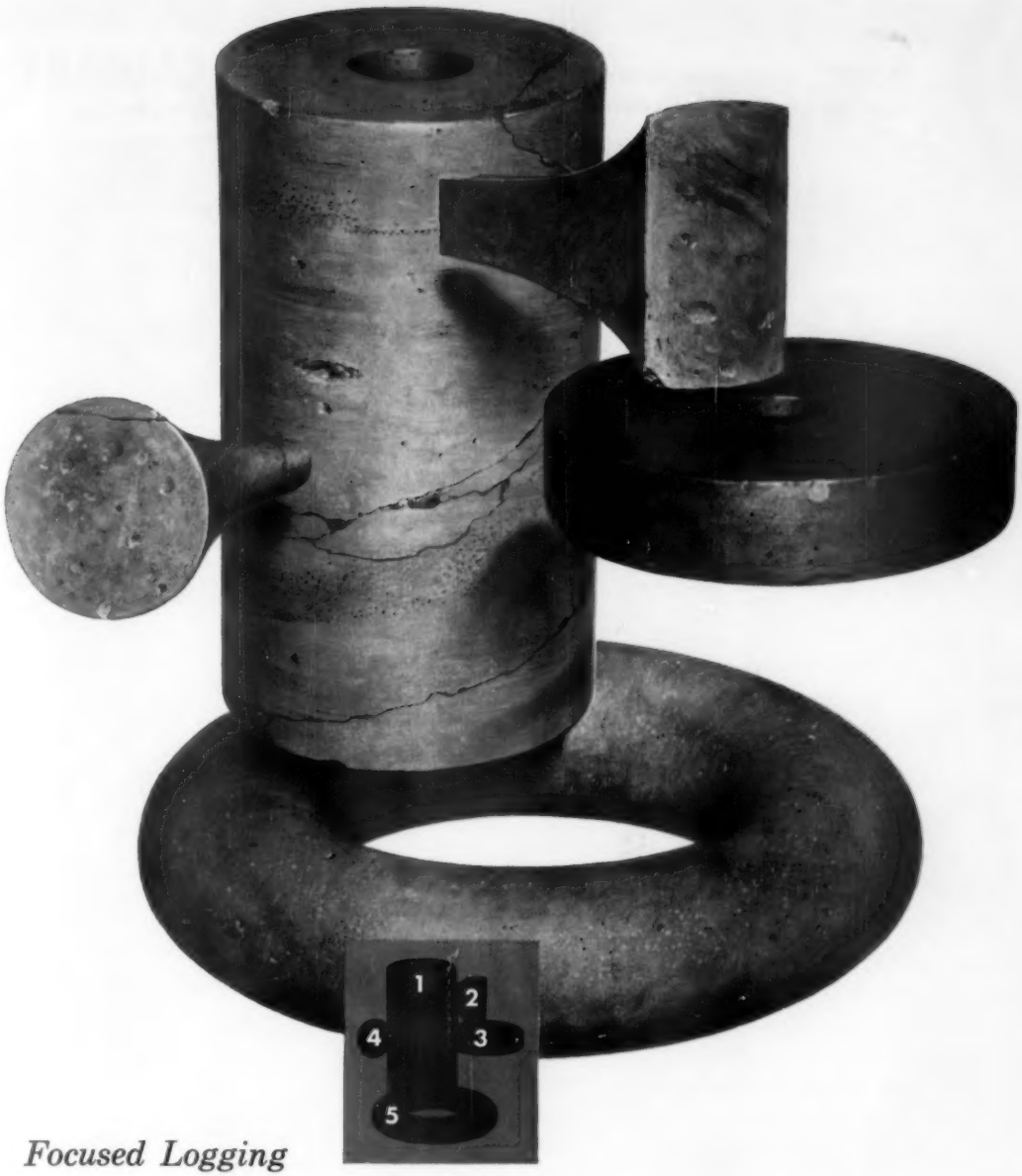


FITS INTO ANY STANDARD 19" ELECTRONIC CABINET.



Focused Logging

... by Schlumberger

meets the challenge

for greater efficiency

in oil finding

Schlumberger Focused Logging directs measurements into specific volumes of formation, giving you:

- *More reliable identification of porosity and saturation.*
- *Cost saving by reducing need for other evaluation methods.*

A decade of research at Schlumberger has produced five Focused Logging Methods. Each, fitted to the right borehole and formation conditions, becomes part of a true oil-finding technique. Your Schlumberger engineer is trained and qualified to recommend the proper logging program for your well.

The artist's concept of the patterns of Schlumberger Focused Logging is represented by sharply sculptured sections lifted from the formations surrounding the borehole. (1) Sonic Log (2) Proximity Log (3) Laterolog (4) Microlaterolog (5) Induction Log.

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and Casper, Wyoming
Braniff serves
both U.S.A. and
South American oil fields
...as no other airline does!
BRANIFF International AIRWAYS
General Offices: Dallas, Texas

Solids levels

. . . can be measured with a new capacitance type of probe. The Model 959-30 probe is based on the principle that capacitance changes as the material height rises or falls around the probe. The probe consists of a glass-fiber epoxy tube with a conductive film on the inner wall. The maker says this construction displays superior abrasion resistence over conventional Teflon-coated probes. Probe length ranges up to 10 ft. However, up to 50 ft. of probe length can be conveniently obtained by adding screw-on sections. The probe mounts to the material storage tank or vessel with stainless-steel fittings. Delivery time: 8 weeks. Price: about $50 to $100. Source: **Magnetic Instruments Co., Inc., 546 Commerce Street, Thornwood, N. Y.**

Clear valve body

. . . shows inside working parts of this new automatic vent valve for water-flood and salt-water-disposal wells so you can tell if they are working without disassembling the valve or taking it out of the system. Made of corrosion-resistant materials, the valve is a direct-acting type with a strong plastic float, synthetic rubber valves, and the clear plastic body.

Installed on a gravity-input well, the valve will vent gas from the well to provide maximum capacity. But it won't let air enter the well. If the well tries to backflow, the valve closes to prevent liquid escape. Installed on high spots on a gravity line, the valve vents gas from the line to keep efficiency high.

The valve holds a back pressure of about 1½ psi. Maximum recommended pressure on the body is 200 psi. Available from stock, the valve sells for about $27. Source: **Kenneth N. Mills, 4128 East Thirty-third, Tulsa.**

Laboratory sampling

. . . made simpler through the use of this new vacuum pump. It is designed to meet the need for an easy method of sampling where contamination must be avoided and where highly corrosive liquids are involved. The Model D. Golden Thief pump handles liquids up to the consistency of syrup as well as powdered solids that have a tendency to slump or seek their own level.

Lift of the pump is about 25 ft. of water at sea level. Material passes through the tubing from the sampling source directly into the sample container. It never contacts any part of the pumping unit. Motive power is provided by the vacuum created in the sampling container on the upstroke of the pump handle. Source: **W & M Mfg. Co., Box 9311, Chicago 90.**

work boat POWER!

Got a tough boating job? Here's the motor that takes it in stride—Evinrude's 1960 Big Twin! 40 horsepower at 4500 rpm. Big-load power that loves to work. It's as easy to pull over and start as most motors half its size—and thermostatic temperature control keeps it running at peak efficiency in any weather, on any water. Choice of props to fit boat and work. For constant, rugged duty, there's no finer outboard power—or more economical buy—than the stout-hearted Big Twin.

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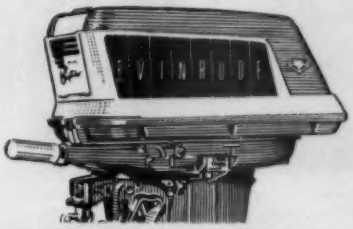
FIRST IN OUTBOARDS



WORKOVER TIME REDUCED . . .

KINZBACH PILOT SPEEDMILL DRILLS UP LINERS AT RAPID RATE WITH MINIMUM TOOL COST!

Cutting blades of sintered tungsten carbide aggregate are accurately centered in casing or liner by pilot nose for rapid, even cutting. Interchangeable blades can be quickly and easily fitted into a wide range of body sizes with tools commonly found on drilling rigs.

Positive signal of dulled blades by restricted circulation prevents loss of rig time in non-productive rotation.

Write for complete information and prices on Kinzbach Pilot Speedmill Liner Cutter and other milling tools.

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ADVANCES IN
SWABBING
TECHNOLOGY
CONTINUE...

The discovery of new swabbing applications and basic improvements in swab design have expanded the potential market for Well Service Contractors.

OIL STATES RUBBER CO., which gave the industry the fluted mandrel swab, has continued to lead the way in the development of new designs and techniques for broadening swabbing operations.

Among the recent developments by **OIL STATES** are:

The OIL STATES "Slim-hole" Swab . . . an aluminum mandrel swab for use in "tubingless completions" where a swab stuck in the hole might mean a costly "fishing job" or even abandonment of a producing well. The aluminum mandrel may be dissolved by chemicals in the unlikely event that it becomes hopelessly stuck.

The OIL STATES Multiple-stage Swab . . . a two-stage swab for use in tapered strings of tubing and drill pipe. Field tested in one of the world's deepest wells and used successfully many times since.

For complete information on the items mentioned above, or any other OIL STATES products, contact your local OIL STATES Field Representative or write or call . . .

Oil States
OIL STATES RUBBER CO.
"Oilfield Rubber Products of Matchless Quality"
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OSR-10

SHOWCASE . . .

New Literature

Girth seams welded on storage tanks

. . . automatically by using the Arcos-arc CO2 shielded, visible-arc method, as described in a new four-page bulletin. The literature explains that cost savings are realized: (1) by producing more welds in a given time through continuous and rapid operation; (2) by using relatively inexpensive carbon-dioxide shielding gas; (3) by easy slag removal; and (4) by using simple, non-electronic, portable equipment. The bulletin contains instructions, photographs, and a table showing edge preparation and current required for different plate thicknesses. Source: **Arcos Corp., 1500 South Fiftieth Street, Philadelphia 43.**

Synthetic agents

. . . and detergents that are surface active for industrial use are detailed in a 24-page bulletin available upon request. Identified by the brand name Solar, products include various forms of liquid concentrates for wetting, emulsification, suspension, and dispersion; and solid materials for use as detergents, wetting agents, and emulsifiers. The bulletin gives chemical and application specifications for several materials. **Source: Swift & Co., 4200 Packers Avenue, Chicago 9.**

Corrosion inhibitors for refiners

. . . are outlined in a new, obtainable, eight-page brochure, yours for the asking. Supplemented with schematic diagrams, detailed engineering drawings, and photographs, the literature explains and evaluates the application of Kontol corrosion inhibitors to various refinery systems. The brochure describes how and why Kontol is effective in correcting such problems as hydrogen blistering, and in supplementing pH control. Source: **Tretolite Co., Div. of Petrolite Corp., 369 Marshall Avenue, St. Louis 19.**

Integrated system

. . . for process control, known as ElectriK Tel-O-Set is described in a series of seven new literature pieces. The system features two-wire d.c. transmission and requires no line power at the field-mounted transmitters and transducers.

Specification Sheets FS 301-2a to 11 outline the pressure-to-current and current-to-pressure transducers; the process pressure-to-current and millivolt-to-current transmitters; recorders and control stations; indicators and control stations; and power supply. Source: **Minneapolis-Honeywell Regulator Co., Wayne and Windrim Avenues, Philadelphia 44.**

Noncontact gage

. . . for both metal and nonmetallic pipe walls supplies measurements of pipe wall thickness with an accuracy of 1%. Bulletin 13-200 describes product modifications, shows actual installations, and includes line drawings showing how the gage can be set up to measure either one or two walls.

According to the four-page publication, the one-wall pipe gage will detect above-and-below tolerance walls and eccentricity, while two-wall units can be used to indicate precise cutoff point, weight-per-foot, and inside diameter. Source: **Daystrom - Weston Sales Div., 614 Frelinghuysen Avenue, Newark 12.**

Barrel-drain truck

. . . containing only 16 bolts is featured in an illustrated single-sheet bulletin. It tells how the Model 4838 Knockdown barrel-drain truck is shipped flat to reduce delivery costs and to facilitate in-plant temporary storage.

Complete specifications are given including over-all length, width, height, weight, local capacity, and list prices. The unit is available with either two or four wheels. Source: **Bond Foundry & Machine Co., Dept. K, Manheim, Pa.**

Isotope use

. . . in industry is discussed in a new 12-page bulletin—Industrial Radiography With Radioisotopes—describing equipment and methods of radiographing various industrial products. The illustrated publication lists advantages peculiar to isotopes in radiography, selection of the proper isotope for a particular job, and methods of making radiographic exposures.

It also contains a chart of equivalent energies, showing typical exposure times required to radiograph various materials of varying thicknesses with some of the popular isotopes. One section explains how to solve the half-life problem of isotopes without down time on the unit, and another lists various radiation-monitoring devices. Source: **Picker X-Ray Corp., 25 South Broadway, White Plains, N. Y.**

DIRECTIONAL DRILLING • FISHING & CUTTING • ELECTRICAL WELL SERVICES • OILFIELD SUPPLIES • EXPORT TOOLS & SERVICE

HOMCO

Fishing, Cutting

THE HOMCO WASHOVER DRILL COLLAR SPEAR

prevents drill collars from falling during washover operations

When you call Homco for a fishing or cutting job you know you are getting the most skilled help in the oil fields. Thirty one years experience in the field enables Homco to offer you an unequalled service. Trained and experienced operators use the Homco designed tools that get the job done fast.

As an example, in many instances drill collars are lodged some distance from the bottom of the hole and when washed over they fall to the bottom, necessitating an extra trip into the hole to retrieve them. And, in many cases the collars lodge on the bottom requiring additional washover operations.

The Homco Drill Collar Spear is designed to prevent this. This tool has the spear attached to the wash pipe through shear pins allowing the spear to be screwed into the joint connection of the collar. After the connection is made the pins are easily sheared, allowing washover to begin. The spear is in the catch position as the collars are washed over preventing the collars from falling. A free point indicator may be operated through this tool at any time.

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HOMCO has it!

▶ ▶ ▶ Equipment Men Notes

J. E. (Ed) Byers is appointed

J. E. (Ed) Byers

. . . regional sales manager of the Gulf and Pacific regions of Black, Sivalls & Bryson, Inc., according to Paul Bartley, division manager. Byers will direct activities of BS&B's Alice, Houston, Los Angeles, and New Orleans oilfield sales districts.

The newly appointed regional sales manager has been with the company since 1936. He became manager of the Tulsa sales district in 1952, his most recent position.

Houston office is opened

. . . by Jas. D. Hughes & Associates, specialists in sales consulting and market research. The new organization will utilize services of sales, management, and engineering executives.

James D. (Jim) Hughes headed the sales activities of Lane-Wells Co. for more than 19 years. He recently resigned as vice president to start his own company.

Previously he served as president of Eastman Oilwell Survey Co. of Texas, and as president of Oil Well Engineering Co. of Texas, exploiting patents he had secured on straight-hole bits and side-tracking devices.

Wesley E. Gatewood appointed

. . . director of field sales for Barrett Division of Allied Chemical Corp., according to G. Peter Oldham, vice president in charge of marketing. Gatewood joined Barrett in February as director of sales training and promotion after 12 years with Armstrong Cork Co. He served as Armstrong's assistant sales manager in the Philadelphia district.

Crane Co. expands fabricating

. . . facilities in the United States and Canada by acquiring Pipe Fabricators, Inc., East Chicago, and Canadian Pittsburgh Piping Ltd., Hamilton, Ontario, announces T. M. Evans, Crane chairman.

All of Crane's domestic and Canadian fabrication of pipe for utilities and chemical plants and special fabricated valves will eventually be concentrated at these two new plants. However, Crane has no intention of going into the actual contract work for installation of piping, Evans said. Crane's fabricating piping departments at Chicago and Birmingham will soon be transferred to East Chicago, according to Evans.

Pipe Fabricators, Inc., will be operated as Crane Co. Pipe Fabricating Division. Canadian Pittsburgh Piping, Ltd., becomes a subsidiary of Crane, Ltd., and the name will be changed to Crane Piping Ltd.

General Controls Co. transfers

. . . Malcolm L. Johnson to Cincinnati where he is a district sales engineer, and names Lewis M. Bound, Jr., northern California sales representative. Both men will handle sales for the company's Tork-Master and Foster Engineering Division products. Announcement of the changes was made by J. F. (Jack) Ray, vice president in charge of sales.

Johnson, former sales engineer with General Controls Co.'s Chicago branch office, will be responsible for the territories of southern Ohio, southern Indiana, and Kentucky.

Bound is located at the firm's San Francisco factory branch office. Before his affiliation with General Controls, he was sales representative for William Powell Co. He also held a similar position in the New York and San Francisco branches of Tube-Turns Co.

Allis-Chalmers announces three

. . . new appointments for its Pacific region as follows: J. A. Longley, regional representative for transmission and distribution equipment; T. E. Meyers, manager of the San Francisco district; and G. K. Lewis, manager of the Portland district.

Longley had been with Allis-Chalmers San Francisco district since 1946, and has been manager the past 9 years. He will continue to headquarter in San Francisco.

Meyers had been manager of the Portland district since early this year. He was a sales representative in the Los Angeles district from 1952 to 1957 when he was transferred to Portland.

Lewis had been a sales representative in the San Francisco district since 1948 and manager of utility sales there the past 3 years.

Jones & Laughlin Supply makes

. . . R. E. Dame a salesman at Edmonton, Alberta, according to W. L. Wolfe, vice president in charge of sales. Dame, a graduate of J&L's sales-training program, began his employment with the company last year at Edmonton.

Hills-McCanna Co. opens offices

. . . in Houston, Baton Rouge, and Birmingham, and relocates its San Francisco district office to San Leandro, Calif.

The Houston office is under the direction of C. T. Williams. W. I. Brittain handles the Baton Rouge office and H. B. Ford has charge of the office at Birmingham.

The new San Leandro office is under the supervision of E. H. Lund, district manager. G. F. Dean has been added to Lund's staff as a sales engineer.

Victor M. Morgan becomes

. . . a sales engineer at the Houston office of Daniel Orifice Fitting Co. Morgan formerly worked for Celanese Chemical Corp. in Pampa, Tex., with Walter Kidde Engineering Co. in various parts of the country, and with Farnsworth & Chambers Construction Co. in Houston.

Douglas K. Ridley is appointed

. . . contract sales manager for automatic control equipment produced by Minneapolis-Honeywell Regulator Co.'s Philadelphia-based Brown Instruments Division and other Industrial Products Group units. He will be responsible for contract operations embracing installation and servicing of industrial instrumentation systems designed and developed by Honeywell.

Ridley joined Honeywell's Commercial Division in 1947. He served as regional sales manager in Dallas and Chicago prior to his present assignment. The Industrial Products Group markets automatic control products manufactured by the company's Brown Instruments, Valve, Industrial Systems, Fall River (Mass.), Rubicon Instruments, and Heiland Divisions.

Howard Supply Co. to represent

. . . Rolo Mfg. Co. products in California, according to a joint announcement by H. E. Howard and R. K. Franklin, presidents of Howard and Rolo, respectively. Howard Supply, headquartered in Los Angeles, has stores in Bakersfield, Taft, Santa Maria, Ventura, and Long Beach, Calif.

Rolo manufactures wellcheckers, oil and water meters, metering separators, free-water knockout units, calcium-

The FULL LINE in

PUMPING UNITS

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BY PARKERSBURG

No other oil-field manufacturer builds **all three**—chain, geared, and pneumatic pumping units. When you buy Parkersburg, you buy top quality in complete confidence from an organization backed by 62 years of experience. The Parkersburg Rig & Reel Company builds, sells and services the most complete line of production equipment available to the petroleum industry.

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ABOUT PARKERSBURG PUMPING UNITS,
SEE YOUR DEALER TODAY.

THE PARKERSBURG RIG & REEL CO.

THE
PARKERSBURG
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Division of Parkersburg-Aetna Corp.

PARKERSBURG • HOUSTON • TULSA

Parkersburg Pumping Units Are Available Through the Following Supply Stores: American Pipe & Supply Co., Beacon Supply Co., Bovaird Supply Co., Canadian Equipment Sales & Service Co., Ltd. (Canada), Franklin Supply Co., Franklin Supply Co., Ltd. (Canada), Houston Oilfield Material Co., Inc., Industrial Supply Co., Iverson Supply Co., Midland Supply Co., Inc., Mountain Iron & Supply Co., Oil Equipment, Ltd. (Canada), The Producers Supply & Tool Co., Republic Supply Co., Rodman Supply Co., Superior Iron Works & Supply Co., United Supply & Manufacturing Co., Wilson Supply Co.

BUYING OR SELLING

Quality made Larkin the leader, and you can buy, or sell Larkin Fittings with full confidence that they are the finest fittings made.

LARKIN
...Through Your Supply Store

PESA

LARKIN PACKER COMPANY, INC.

WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

chloride gas dehydrators, custody-transfer meters, and various types of line meters. The firm is represented in other domestic areas by Bethlehem Steel Co.'s Supply Division.

Cooper-Bessemer gets contract

. . . totaling $4,000,000 from Transwestern Pipeline Co., Houston, for 10 of C-B's largest engines and centrifugal compressors for mainline gas-transmission service. The order is for compressor machinery for Transwestern's 30-in. gas pipeline running from the Texas and Oklahoma gas fields to the California border near Needles, Calif.

The gas engines are turbocharged Cooper-Bessemer Type LSV 16-cylinder units. The centrifugal compressors —Type RFB-24—are direct driven by the LSV engines through speed increasers.

Rockwell Mfg. Co. will build

. . . a new 150,000-sq. ft. addition to its plant at Pinneberg, West Germany for the manufacturer of liquid meters and valves, according to Willard F. Rockwell, Jr., president of the Pittsburgh concern.

In addition to providing facilities for these products, the new building will also house production facilities for larger sizes of Rockwell-Nordstrom lubricated plug valves. Smaller sizes are already being produced in an earlier plant addition completed a year ago.

Dow Chemical sets up terminal

. . . for 50% caustic soda solution at the site of the Rocky Mountain arsenal in Denver to service industries on the eastern slope of Colorado, Wyoming, and western Nebraska.

The terminal, to be operated by Mesa Chemical Corp., will provide tank-truck delivery to points in the three-state area. Caustic will be supplied to the terminal by rail shipment from Dow's division in Freeport, Tex.

G. R. Brown is elected to board

. . . of directors of Lone Star Steel Co., according to Fred F. Florence, board chairman, and E. B. Germany, president of the steel company. Brown, executive vice president of Brown & Root, Inc., succeeds the late John W. Carpenter.

Longhorn Supply Co. is named

. . . the first distributor of a new pressure-sealing gate valve manufactured by W-K-M Division of ACF Industries, Inc. This is part of W-K-M's plan to market the new valve exclusively through oil-field supply stores and distributors.

Now! FULL-POWER Fire Fighting with this complete dry chemical line!

Kidde top-rated portables and wheeled units kill more fire... faster!

From the powerful new 2½-pound portable, on up to the giant 200-pound wheeled unit, Kidde dry chemical extinguishers pack the *extra* punch needed for stubborn blazes, for *full-power* fire fighting. Available in pressurized 2½, 5, 10, 20 and 30-pound capacities, Kidde dry chemical portables feature simple, one-two operation, are easiest of all portables to operate, even while wearing gloves. Kidde portables have no valves to turn, no pins to pull, need no bumping or inverting. Just aim, pull trigger, and fire's out! All are quickly and easily pressurized, have dust- and moisture-proof gauges which show at a glance when unit is charged.

The 200-pound Kidde pressurized wheeled unit discharges a 40-foot dry chemical stream faster, has an *extra* 50 pounds of fire-smothering dry chemical to knock down fire quicker. It's faster and easier to operate . . . just remove pin, swing toggle lever, and flip on-off lever. Easy to maneuver because of its low center of gravity and larger wheels. Truly a one-man fire engine!

All Kidde extinguishers are granted top rating by Underwriters' Laboratories, are the finest extinguishers on the market today. Get more information about this *complete* line of *full-power* fire fighting equipment. Write to Kidde today!

Kidde

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1254 Main St., Belleville 9, N.J.
Walter Kidde & Company of Canada Ltd.
Montreal—Toronto—Vancouver

DE LAVAL

CENTRIFUGAL COMPRESSORS

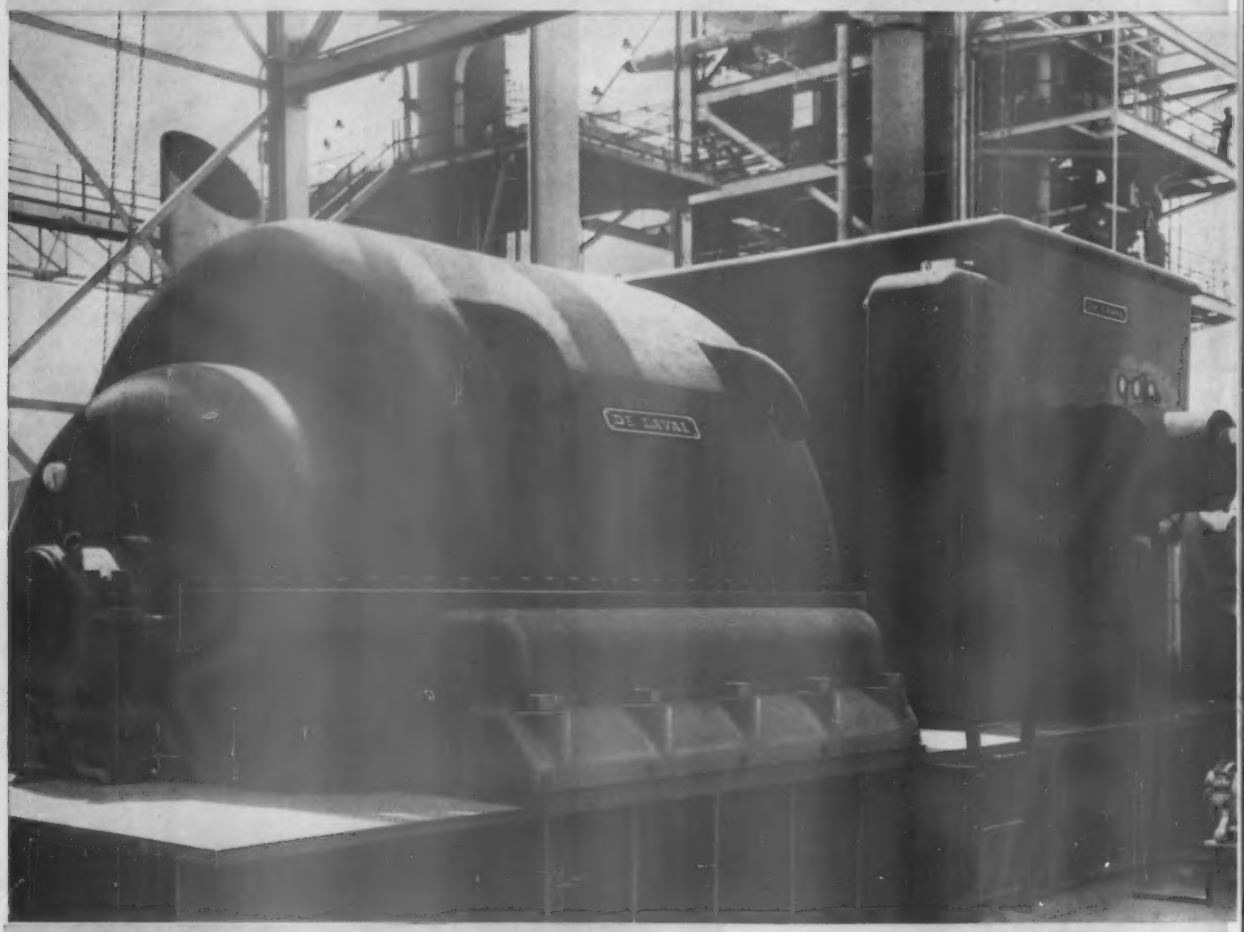
11,300

Driven by automatic extraction steam turbine

Shown below is the large 11,300 horsepower centrifugal blower which compresses air for the main blower service in catalyst regeneration at Standard Oil of Ohio's new refinery at Toledo, Ohio.

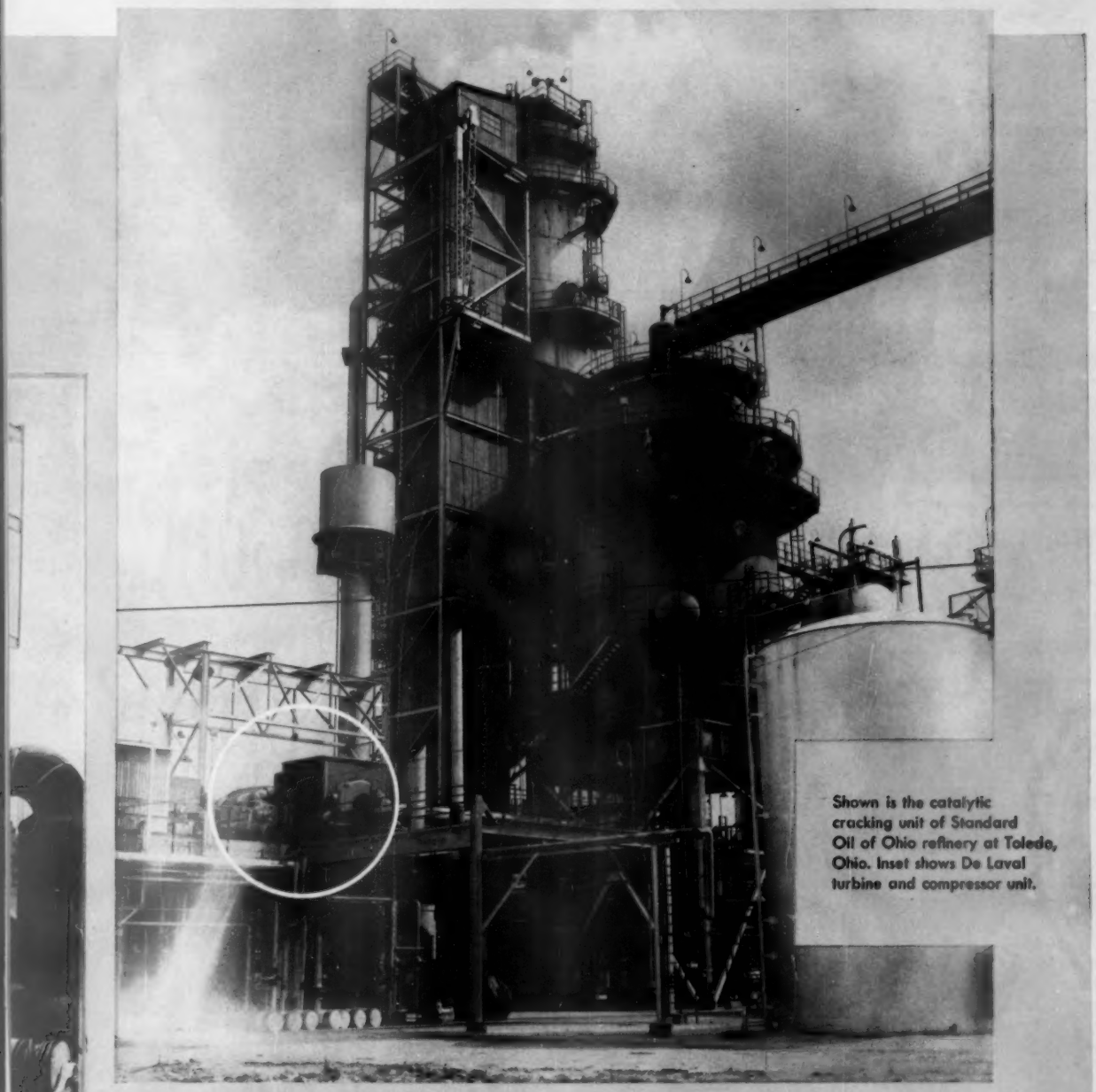
Driven by a De Laval single automatic extraction steam turbine, it compresses 110,300 cfm in four stages at 2800 rpm. Inlet pressure is 14.7 psia and discharge pressure is 40.7 psia. The turbine is designed for 600 psig ISP, 740F extracting at 55 psig, and exhausting to 28″ Hg.

This is another example of De Laval proved performance.



DL-437

horsepower DE LAVAL compressor for "cat cracker" at SOHIO refinery



Shown is the catalytic cracking unit of Standard Oil of Ohio refinery at Toledo, Ohio. Inset shows De Laval turbine and compressor unit.

DE LAVAL *Steam Turbine Company*

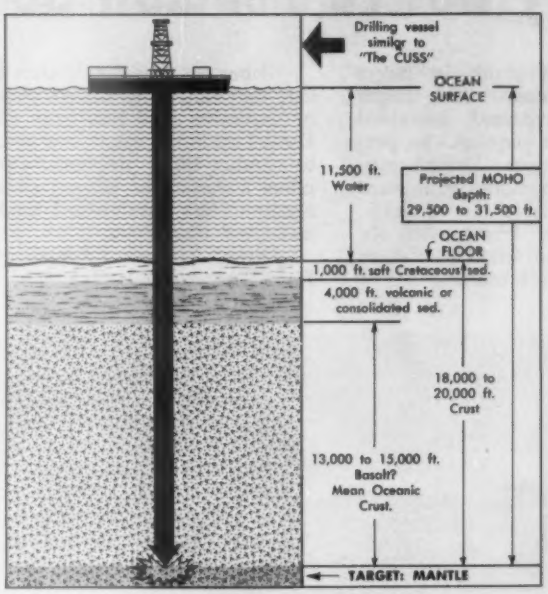
810 NOTTINGHAM WAY, TRENTON 2, N. J.

Season's Greetings

FROM AN
OLD FRIEND
WITH A
NEW NAME

Smith TOOL CO.

(FORMERLY H C Smith OIL TOOL CO.)


Drilling vessel similar to "The CUSS"
OCEAN SURFACE
11,500 ft. Water
Projected MOHO depth: 29,500 to 31,500 ft.
OCEAN FLOOR
1,000 ft. soft Cretaceous sed.
4,000 ft. volcanic or consolidated sed.
18,000 to 20,000 ft. Crust
13,000 to 15,000 ft. Basalt? Mean Oceanic Crust.
TARGET: MANTLE

HERE IS the drilling sequence that Project Moho will attempt to penetrate.

Project Moho

what it is and why it's being drilled

PROJECT Moho will be an effort to drill to the earth's second layer, the mantle, which lies below the crust.

There are two likely spots in the world where the mantle can be reached by drilling a minimum thickness of crust. Both of these locations lie under water. The more desirable, according to oceanographers, is just north of Puerto Rico in the Atlantic. Another site, which will probably receive first attention because it is desired to pick a normal spot with average conditions, is northeast of Guadalupe Island off the coast of Baja California. The offshore Guadalupe point is expected to reach the mantle by drilling 18,000 ft. or less of section.

. . . Beds to be drilled are approximately 1,000 ft. or less of soft Cretaceous sediments, followed by a more dense section, about 4,000 ft. of volcanics or consolidated sediments. Below this is the mean oceanic crust—a layer of 13,000 to 15,000 ft. of even denser material, possibly basalt. At the base of the basalt is the Mohorovicic boundary, which indicates a definite density contrast between the crust and the mantle. This discontinuity was discovered in 1910 by a Yugoslavian professor, A. Mohorovicic. The total thickness of all sediments to be drilled is roughly 5,000 ft., and much could be learned by drilling just this portion. Geologists would like to know what happened to the pre-Cretaceous sediments, which are presumably missing.

. . . What the mantle can tell us is the chief objective of the project. There is much that man does not know about the inner composition of the earth. It is possible that by drilling to the mantle that we can learn more about the earth's origin. At the same time, separate investigations are currently being made by astronomists studying the stars and the solar sys-

ANNOUNCING CHANGE IN NAME

From

DOAK DRILLING COMPANY

To

Shaw-Hughes Drilling Company

P. O. Box 1108 Bristow, Oklahoma

Oras A. Shaw
President

Wm. M. Hughes
V. P. & Gen. Mgr.

Elmer Cathey
Toolpusher

Earlier this year, the company acquired the one-third interest owned by Howard J. Doak, and the name is being changed to now show correct ownership. Shaw-Hughes Drilling Company, under the same management, will continue to operate with the same rigs and equipment, personnel, supervision, and policy. We shall try, as always, to give top performance in efficiency and cooperation.

Shaw-Hughes Drilling Company

Formerly

DOAK DRILLING COMPANY

MAKE YOUR WELLS WORTH MORE

Specify Dowell For Low-Cost

DOWELL FRACTURING SERVICES using water-base fracturing fluids are increasing profit potentials from many formations. Here are several reasons why many operators prefer water-base fluids.

Water is low in cost. In most areas, this means that big, high-injection-rate treatments can be relatively economical. In turn, bigger treatments often result in larger production increases than might otherwise be expected, sustained gains, and faster payouts. To perform these big jobs, Dowell provides powerful pumping equipment —second to none in the oil fields.

Water is safer. Fire hazards are held to a minimum when water-base fracturing fluids are used.

Water is adaptable. If tests indicate that emulsions, silicate swelling or excessive fluid loss may occur, Dowell addition agents can be used to combat these problems. Dowell offers a variety of proved addition agents to adapt water-base fluids to most well conditions.

Dowell has recently developed a Fluid Loss Additive (F.L.A.*) that

Water-Base Fracturing Treatments

gives outstanding results in either water or acid. By using this new additive, operators often get greatly improved results with a negligible increase in treatment costs.

Water-base fluids help increase natural permeability. For example, the fresh water used in Riverfrac* dissolves salt that may be present in the producing formation, while the dilute acid used in Duofrac* dissolves limestone.

The examples below on this page show some popular applications of Dowell fracturing services using water. For more information or service, call your nearest Dowell representative. There are more than 165 locations to serve you in the United States, Canada, Venezuela and Argentina. Or write Dowell, Tulsa 1, Oklahoma. *Dowell Trademark

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Oklahoma's Golden Trend — area of promise for waterflood operations. Riverfrac, a Dowell fracturing service, has been used successfully in both producing and water injection wells throughout the oil country.

Well Conditions Where Dowell Water-Base Fracturing Fluids Are Especially Effective

If you want to fracture a gas well —

RIVERFRAC, using unthickened fresh or salt water, has given excellent results. Because of low fluid costs, large-volume, high-injection-rate treatments are usually profitable. Production increases are often better than those obtained with smaller treatments with more expensive fluids.

If you need to fracture down tubing —

WATERFRAC—using thickened water—is designed to help you. A low sand-falling rate and relatively low fluid loss permit treatment down tubing at low injection rates. Waterfrac is also used to treat water injection wells.

If your producing zone contains salt —

RIVERFRAC, using fresh water, may give a bonus increase in production by dissolving salt and thus increasing permeability. Many treatments in the Permian Basin have removed more than 50,000 pounds of salt per well. Frequently, this salt removal has resulted in substantial potential increases over what could have been expected otherwise.

If you want to give an acid-soluble formation a big fracture treatment —

DUOFRAC is specified by many operators. The dilute acid fracturing fluid can be tailored to dissolve substantial quantities of limestone and salt. At the same time, low fluid costs make big treatments economical. The triple action of Duofrac frequently results in unusually large production increases per dollar spent.

If you want to make sure —

Call the Dowell engineer nearest you. He has full knowledge of Dowell's wide variety of fracturing services, using water-base, acid-base and oil-base fluids. His records of local conditions, as well as the experience of the entire Dowell organization, will be of great help in selecting the proper treatment.

"FRAC GUIDE*" Now in use exclusively by Dowell engineers, this revolutionary new system has increased the success ratio of fracturing treatments by more than 50%. Ask your Dowell representative to engineer your next treatment using the "Frac Guide". This extra service costs you nothing.

Sour Oil, Lodestone, Pressure,
Sand Cutting, Hydrogen Sulfide,
Ball Pounding, Salt Water Brine,
Magnetism, High Temperature,
Impact...Nothing Affects

That's right . . . with DuMore Balls and Seats, none of these conditions will cause a valve failure. DuMore is corrosion-proof to any known well fluid, and its metallurgical properties are surpassed only by the hardness and wearing qualities of tungsten carbide—the hardest metal in commercial use. A bargain at any price, DuMore costs only a little more than regular grade ball valves. Moreover, the expense of one pulling job alone will more than pay for fitting out a pump with DuMore Balls and Seats. • Try DuMore the next time you run a pump. You'll be more than satisfied with the service you'll get, and you'll like saving those pulling jobs, too! Ask your supply store about DuMore.

HF

"Best Balls and Seats in the Oil Patch"

HARBISON-FISCHER · FORT WORTH

tem in an effort to discover the true origin of the earth.

Problems are diverse . . . The biggest single problem will be drilling in the great depths of water. Off Guadalupe Island, anticipated water depth is approximately 11,500 ft. A drilling vessel similar to "The CUSS" will probably be used to provide drill power. Due to tides, wave action, and ocean currents, anchoring the drilling barge in deep water will be difficult. Three alternatives of fixed positioning are: reference buoys, tugs, or several anchors.

Undoubtedly, reference buoys, probably the Isaacs buoy type, will be used. Tugs are out of the question due to the extremely high cost for the long time involved. The problem of using anchors is that at this depth the heavy cables required will support little more than their own weight. To help buoy the cable weight, gasoline-filled floats could be used at 3,000-ft. intervals along the cables.

Costs will be high . . . Estimated costs for Project Moho is figured at 15 to 20 million dollars, to the mantle. A period of 18 months of drilling will be required. Daily costs will average $10,000.

How soon will drilling start? . . . Probably sometime within the next 5 years, according to the experts.

What will Moho tell us? . . . Once the mantle is reached, a series of tests are planned for the hole. These will include coring and logging programs, running velocity surveys and density checks, and using other data-bearing tools. Analysis of the final data may enable us to determine more about the origin of the earth, its composition, along with information on the earth's gravity and magnetic fields.

It is unfortunate that the thinnest section of crust lies in deep water which will afford complex problems, yet this is understandable with 70% of the earth's surface comprised of water.

Why then do our scientists feel that we are ready to drill Project Moho in the near future? There are three factors that have brightened the picture and point to a successful operation. They are (1) a comparatively shallow locale has been found, (2) general technology for deeper drilling has improved, and (3) vast experience has been obtained in offshore drilling from barges.

The drilling site in the Pacific is a good start for developing further deep-drilling techniques and learning more of the earth's secrets.

HALLIBURTON ACIDIZING

"Round-Up"...

a right type acid for the right zone

Because every well is not the same, varied acidizing materials and techniques are necessary for superior results.

Halliburton has available many basic chemicals and additives that may be combined in different ways to satisfy most special well conditions.

Halliburton Acidizing Services and Halliburton trained and experienced operating personnel can aid in helping you determine the right type acid for the right zone... helping to increase production in new wells and improve production in older wells.

After a careful and complete analysis of your formation requirements, determined by a Halliburton Chemical Laboratory examination, one or a combination of these Halliburton additives may be the "stimulation factor" for profitable production results.

HALLIBURTON REGULAR ACID...
an effective and economical stimulation aid for most limestone and dolomitic formations.

HALLIBURTON NON-EMULSIFYING ACID...
a composition of regular acid, plus an individually selected Halliburton "N" compound designed to aid in preventing emulsions during acidizing. Halliburton "N" agents may also be sediment dispersants which act by oil coating the insoluble silicates while leaving the calcareous rock water wet.

HALLIBURTON PENETRATING ACID...
composed of regular acid plus an additive for surface tension reduction. The surfactant effectively lowers the surface tension of both raw and spent regular acid and can also be used with other acid mixtures. Its greatest application is in formations normally requiring prolonged "clean-up" time after treatment which may be due to "jamin-effect".

HALLIBURTON MUD CLEANOUT AGENT (MCA)...
regular acid containing a unique synergetic blend of surfactants called Morflo II. This Morflo II-Acid combination, MCA, is specifically designed to remove flow restrictions caused by water, emulsions and/or solids.

HALLIBURTON HV ACID...
its name implies high viscosity. Retards chemical reaction of acid on limestone formations allowing penetration of unreacted acid a greater distance from bore hole. Also used as diverting agent.

HALLIBURTON Fe ACID...
a regular penetrating acid with a conditioning agent to minimize re-precipitation of dissolved iron salts and oxides during acidizing. Best suited where abnormal amounts of iron are dissolved by acid prior to its spending on formation, such as conditions associated with disposal and injection wells.

HALLIBURTON HF ACID...
a combination of hydrochloride and hydrofluoric acids specifically designed for treatment of siliceous formations.

HALLIBURTON ACID INHIBITORS...
a necessary protective additive used in all Halliburton acid solutions to reduce reaction on downhole equipment.

When you consider the stimulation benefits of Halliburton acids and inhibitors... there can be no other acidizing choice!

Help your well to get the right type acid for the right zone.

HALLIBURTON CHEMICAL SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

GET THE MOST

USE MISSION PUMP PARTS TOGETHER FOR LONGEST LIFE – GREATEST SAVINGS

Taken individually, the savings you get from any of these Mission pump parts is substantial. But when used together, savings pyramid and down time is drastically reduced. Here's why: each of the Mission parts is the best of its kind that can be made. Mission engineering, Mission quality control, and Mission's experience and research in pumping drilling fluids have seen to that. The truth is that a Mission piston works better and lasts longer in a Mission liner that is specifically made for it. Liners also last longer with Mission pistons because the fabric back of piston rubbers reduces the danger of serious scoring or fluid cutting. So . . . don't just half save. Use only Mission parts on all your pumps. Save all the way.

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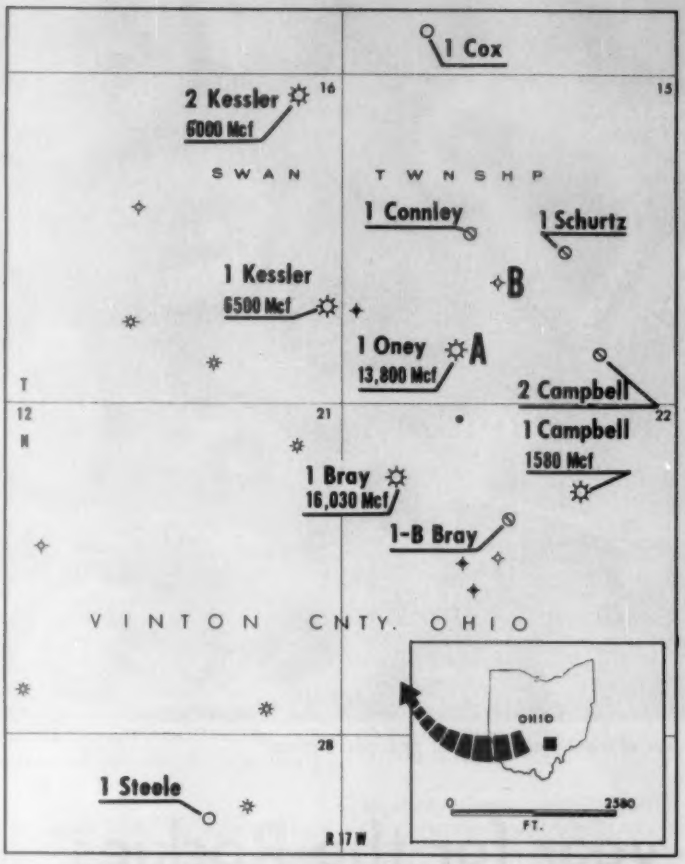


GAS EXPLORATION in the older producing regions has proved rewarding to Ohio explorers. Typical of the programs now under way in many older fields is the one in Swan Township, Vinton County. Five gas wells have been finished and six more are drilling or ready to spud.

Wildcatters cash in on new methods in old areas

BY FRANK J. GARDNER

IT TAKES COURAGE to drill an offset to a dry hole. But when that dry hole is 50 years old, the risk, in the light of today's drilling and completion techniques, is reduced.

That's the lesson being learned today in one of our oldest oil and gas states, Ohio. And independent operators are making the most of it. In recent years, there's been a profitable and logical rebirth of interest in such areas. For no doubt much undiscovered oil and gas remained behind in the exodus to the Southwest during the early 1900's.

Clues from history . . . A typical search is now going on in Swan Township, Vinton County, Ohio. Here, in the midst of many old dry holes and abandoned producers, independent wildcatters are having a field day. Using yellowed driller's logs, some of them nearly 60 years old, these explorers glean what subsurface dope they can, detect overlooked possibilities, and stake their drill sites without regard to older failures. Then, with modern approaches to drilling and completion that were unknown in the old days, they bring in good wells where none existed before.

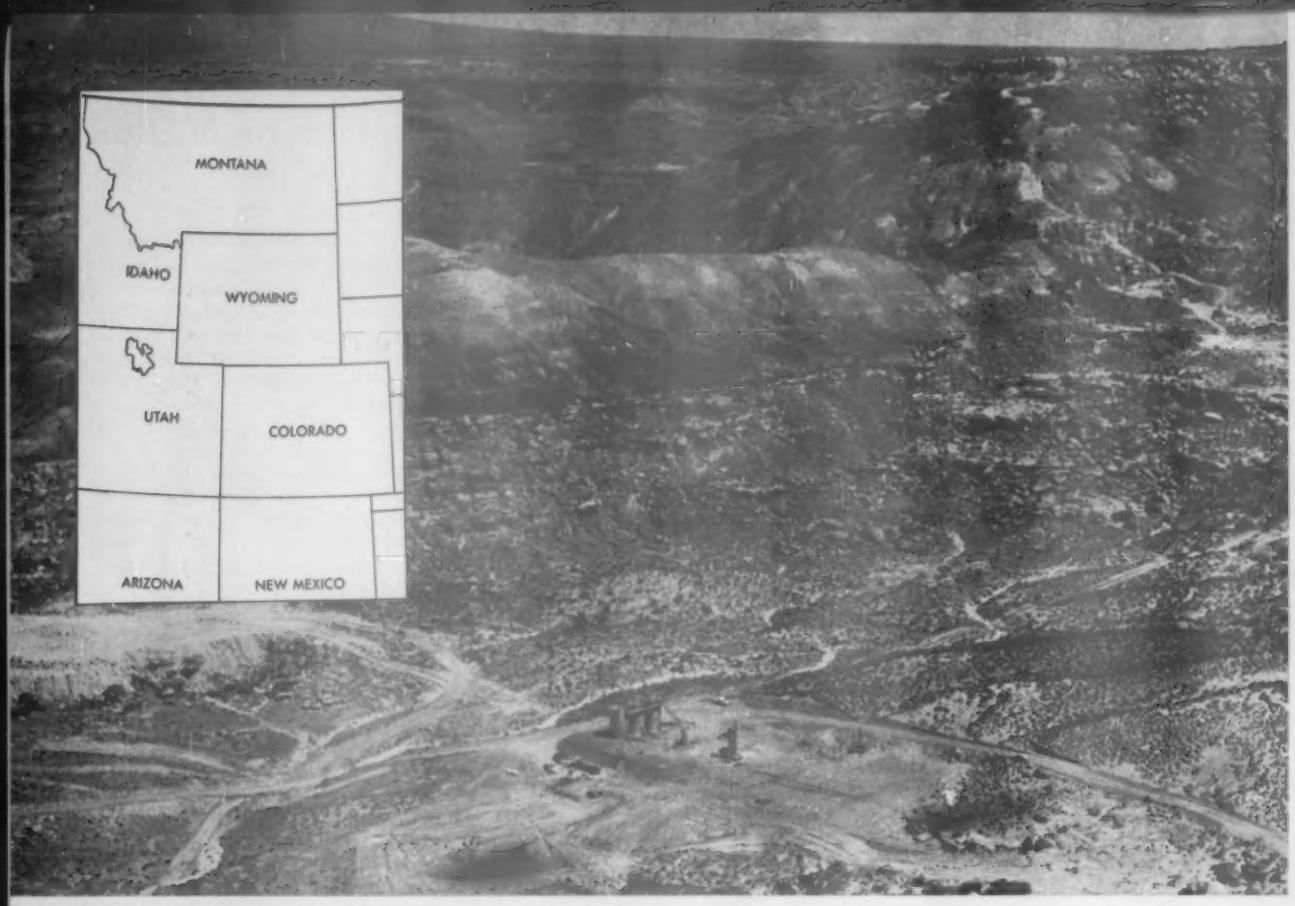
Take a look at the success of some of these operators: Roberson-Williams Oil Corp., of Coshocton, Ohio, recently completed its 1 Oney (A on map) for 13,800 M.c.f. of gas per day from Clinton-Silurian sand at 2,751-63 ft.; it now has two more wells drilling. Four other gas wells, all tagged on the map, have come in for potentials ranging from 1,580 to 16,030 M.c.f. per day. These belong to Darrell Blanton et al. Four more are drilling and locations are made for two others. The dry hole at B on the map is literally surrounded by drilling wells and the Oney producer.

Point to new reserves . . . Roger C. Williams, vice president of Roberson-Williams, describes his approach to the Swan-Vinton prospect as some kind of historical treasure hunt. "When we took our first lease," he says, "we picked up 18 logs in Clinton and Medina wells at the geological survey office. These covered wells drilled before 1950. The first log was dated 1901, another 1903, several in 1920, some in 1936, and some in the forties . . . The dry hole in Section 15 was drilled in 1903; the log shows they drilled only 6 ft. after hitting the Clinton sand."

By drilling deeper into the Clinton and fracturing, these Ohio companies are opening new gas reserves every day. At the 1 Oney, Roberson-Williams had a natural flow of 1,100 M.c.f. per day; after fracturing the Clinton with 345 bbl. of oil and 10,000 lb. of sand, the potential was boosted to 13,800 M.c.f.

Swan-Vinton is only one among many places in the Appalachian province where independents stand a good chance of success. The methods employed here are applicable almost anywhere in the old, "depleted" fields of Ohio, Indiana, Pennsylvania, and West Virginia.

Is it worth the while? Obviously. Says Williams: "We have no proration law, and with the exception of local bottlenecks in the gas-transmission system, we have a ready year-round market for gas at 24 cents per M.c.f.".



MOUNTAIN-STATE EXPLORERS are ending a year of highly important oil and gas finding.

1959: Biggest year for the Rockies

BY JOHN C. McCASLIN
District Editor

EVERY CORNER of the Rocky Mountain region has something to offer in the way of big exploratory news this year. No state has been left out. Some have better and more glowing records than others, but the wildcatters have made 1959 the most significant single year yet in this far-from-mature province.

On the north . . . Exploratory tests in Montana are down from previous years, but there have been some newsmakers just the same. The Williston basin portion of the state on the east, the Central Montana plains, and the Disturbed belt on the northwest have all seen action this year.

The most important discovery of the year for Montana is Mobil Oil Co.'s Mission Canyon Mississippian find in Sheridan County. A prolific oil flow was reported at the 8,000-ft. mark at this remote wildcat more than 35 miles southeast of nearest production at Outlook field. The well lies in a sparsely drilled section in the central portion of the Williston basin. The successful well will put some much-needed heat on the potential of this huge central Williston area where the only production is at Outlook, Brorson, and Writing Rock. There's lots of Williston basin between Poplar on the west and Bottineau on the east that needs a more thorough goingover than it has been receiving in the past few years.

. . . Central Plains. The development of Stensvad field and Tyler sand production is the big story in Central Montana. The field was opened last year but has gotten most of its growth in 1959. This section of the state is another wildcat frontier that has scarcely been invaded. Stensvad's success should change all this in the coming few years.

. . . Disturbed belt. Though there is only one producing area in this region, drilling still goes on. Northern Natural Gas Producing Co. is drilling at 1-C Blackleaf-Federal in Teton County to the Madison at 5,500 ft. This wildcat is 6 miles north of the only production on the U. S. side of the belt at Blackleaf. That well was completed for gas in 1958 by Northern Natural.

In the Dakotas . . . Two wildcats in North Dakota have captured the interest lead in this part of Williston. One is the first production for Dunn County at the extreme south end of the Nesson

Paradox, Williston, and Wyoming bag year's major discoveries

anticline; the other is 32 miles southwest in a previously undrilled area of McKenzie County.

Dunn's first oil well is Amerada Petroleum Corp. 1 Signalness Unit, a Duperow-Devonian strike which opened Lost Bridge field for 313 bbl. of oil per day from perforations at 11,538-11,572 ft.

Shell Oil Co. and Northern Pacific Railway Co. opened the state's seventy-seventh oil field at the 32-15 NP in McKenzie County's Badlands. Flow was 1,500 bbl. daily at this Mississippian Medora area wildcat. The well is farther from production than any other North Dakota discovery in recent years, being 35 miles north of Scoria and about 35 miles from Nesson anticline fields. The wildcat is one of three that Shell drilled in the remote sections of North Dakota—the first two being dry.

... South Dakota's big year. As was earlier predicted, South Dakota is enjoying its best drilling year yet. Focal point of a heated drilling campaign is Harding County's Buffalo area. There have been 10 important extensions to the Red River Ordovician producing area in northwestern South Dakota and one distinctly defined oil discovery. Half a dozen rigs turning here promise this play will go on into the new year.

In Wyoming . . . This state has been the busiest in the Rockies this year. Completions, both field wells and wildcats, are ahead of last year. But the big story in Wyoming is the importance of the wildcatters' success in mainly the Green River, Wind River, and Powder River basin.

... Green River. This southwestern Wyoming basin now looms as one of the oil and gas giants of the Rockies. Primarily a gas haven in recent years, the basin is now emerging as an oil hopeful. The big play has been in the Desert Springs area where Almond Mesaverde Cretaceous gas exploration highlighted 1958 activity, but in 1959 the Almond gas turned to oil.

Texas National Petroleum Co. opened the Almond play at West Desert Springs. This was followed by El Paso Natural Gas Products Co.'s Almond oil find at Patrick Draw. The discovery well flowed 637 bbl. of oil per day while the confirmation made 1,135 bbl. daily. These Almond discoveries firmly entrench the Mesaverde Cretaceous section in Green River as a prime target for future exploration. In years past Mesaverde oil and gas have been restricted to the southern Rockies, but in the past couple of years Mesaverde oil and gas have moved north into Wyoming where it is now a major producer. This Mesaverde interest is not confined to just Green River, but also is a big factor in recent Powder River basin successes.

... Wind River. This Central Wyoming basin, nearly passed by in all the flurry of exploration in Wyoming in the past few years, is back in line for wildcat prominence. Recent Tertiary and Upper Cretaceous discoveries along the unexplored northern and northeastern rim of the basin put Wind River in a lofty position for coming wildcat interest in the Rockies. First Lance Upper Cretaceous oil production at Waltman Unit, rapid development of Tertiary oil and gas in the Lysite and Lost Cabin units, and further plans for Cooper Reservoir and Badwater Unit should place Wind River among the Wyoming hopefuls next year.

... Powder River. This northeastern Wyoming basin is in the midst of its most active session since the Weston County boom. There have been four important new fields opened this year — Rozet, Timber Creek, Miller Creek, and a new one northeast of Donkey Creek. The big shot here is the Cretaceous and Pennsylvanian rocks.

In Denver basin . . . This northeastern Colorado-western Nebraska basin still plays a major role in Rocky Mountain exploratory success. There were a dozen oil finds in November alone. One well in Morrill County, Nebraska, flowed 840 bbl. of oil per day from the Dakota "J" sand. These sort of gages keep this basin in a respected place among the explorers.

In the Piceance basin . . . This northwestern Colorado area just tagged its most significant oil find in recent years. Texaco Inc. gaged more than 1,000 bbl. of oil per day on tests of the Weber Pennsylvanian at a deep wildcat inside Moffat field, Moffat County. This is the best Weber strike in a long time, lending some much-needed hope to the search for oil in this formation that began last year throughout the basin. The Moffat find should be a signal for what lies ahead for this deep section of Rangely fame.

Paradox retains lead . . . The two Four Corners basins, Paradox and San Juan, continue to lead the entire Rocky Mountain region in discovery news. One discovery, Northwest Lisbon in San Juan County, Utah, could well be called the big oil and gas news of the year for the entire nation.

... Northwest Lisbon. Pure Oil Co. came up with the brightest discovery in the Paradox basin since Aneth itself at 1 Northwest Lisbon. The operator uncovered 17,500 M.c.f.d. from Mississippian, opening Utah's second Mississippian field, the Paradox's third Mississippian field, and then on to find oil in the Devonian to give the southwestern Rockies its first Devonian production.

To the southeast 15 miles Pure opened Colorado's first Mississippian production at Southeast Lisbon. Both wells are on the Lisbon-Dolores anticline. Earlier this year Texas Pacific Coal & Oil Co. found Mississippian oil in Arizona, giving that state its second oil well, and the basin its second Mississippian producer.

... Pennsylvanian strikes. At the beginning of the year Paradox basin oil production moved across the line into Colorado after a hard-earned exploratory stretch. Fields like Flodine Park, Towaoc, and a recently completed discovery in Montezuma County prove that southwestern Colorado had plenty of potential as a Pennsylvanian oil reservoir perhaps as big as its neighboring San Juan County, Utah.

... San Juan basin. Cretaceous Dakota rocks, long underestimated in the San Juan basin, now are a byword to explorers in northwestern New Mexico. More discoveries were made in this zone than any other this year. The entire Blanco field area which covers most of the basin is dotted with new Dakota oil and gas finds.

Interesting signposts . . . The Rockies are always full of surprises. This year has been no straggler. Next year will

Guide to Exploration

Your file of 1959 Journals will be more valuable if you take advantage of the free index the Journal is offering to its readers.

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be even better. Places to watch for wildcat action in the coming months are the northern Paradox basin, northeastern Arizona, New Mexico's Lucero basin, the southeastern Rockies' Las Animas arch country, Green River, Wild River, and Powder River basins, and the deeper portions of the central Williston basin. Formation names that you will be reading about in coming months include Dakota, Almond, Devonian, Red River, Lance, and Mesaverde. Some of them are old names, some are new, but they all have bright producing futures ahead of them.

S. D. field extended

South Dakota's Buffalo field gained another extension. It is Shell Oil Co. 14-17 State, SW SW 17-21n-4e, Harding County. The Red River Ordovician well pumped 124 bbl. oil and 40 bbl. water. It is a southwest extension of the central part of the well.

Big hit for Williston

THE YEAR'S most important wildcat discovery for Williston basin is complete in Mission Canyon Mississippian. Shell Oil Co. and Northern Pacific Railway Co. finaled 32-15 NP in SW NE 15-145n-101w, McKenzie County, North Dakota, for 1,526 bbl. of oil and 65 bbl. water per day, 4% cut. Choke was 32/64-in. Perforations were at 9,399 ft.

This new oil find, 35 miles from any production, is in the Medora area. It lies southwest of Nesson anticline's south end and about the same distance northwest of production in Billings County.

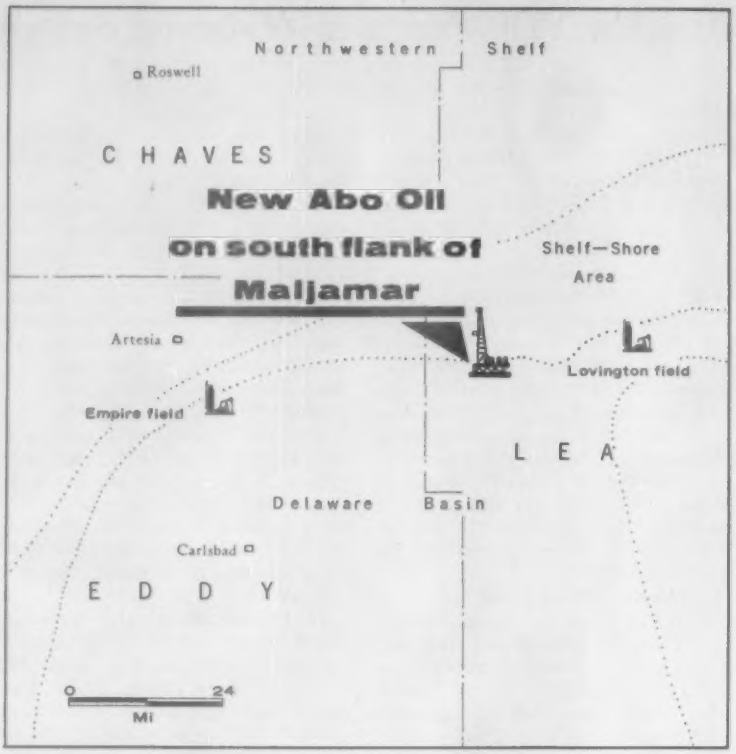
Denver basin adds three new fields

A trio of Cretaceous discoveries was reported in the Denver basin. One was in Colorado's Washington County, the other two in Banner County, Nebraska.

The Colorado find is Anderson-Prichard Oil Corp. and Tipps Drilling Co. 1 Ben Gay, NE NE 1-4s-54w. It pumped 170 bbl. daily from "J" sand. Location is 4 miles southeast of Roderick field.

Petro-Lewis Ltd. et al. 1 Pile in Banner County, SW NE 12-17n-55w, pumped 220 bbl. of oil daily from "J" sand at 6,110-55 ft. This is the discovery of Pile field. It is 2½ miles northeast of Weaver field.

The other Nebraska well is Petroleum, Inc. 1 Blake-G, C SW SE 15-17n-56w. It pumped 204 bbl. daily from "J" sand perforations at 6,630-43 ft. Location is 1 mile south of Brinkerhoff field.



A NEW ABO oil-producing reef is in prospect along the northern limits of Delaware basin in Lea County, New Mexico. Carper Drilling Co. 1-A Federal MA in 31-17s-33e is situated about two locations south of Grayburg production in East Maljamar field, and is surrounded by 4-000-ft. dry holes. Currently, operators are looking at 200 ft. of reef saturation and preparing for tests.

Abo reef offers new pay at edge of Texas' Delaware basin

ANOTHER ABO REEF BUILDUP, with a thick oil-saturated section, has been found along the extreme northern limits of the Delaware basin. Upon successful completion, it will mark the third Abo find along the basin's edge since discovery of Empire-Abo field 10 miles east of Artesia by Pan American Petroleum Corp.

The Abo pay is a barrier reef of lower Leonard (Permian) age and extends across southeastern New Mexico in the subsurface from depths of 4,500-8,300 ft. It presently produces in two fields some 50 miles apart on the same trend and has indicated exceptionally large reserves at reasonable depths. (See New Empire Abo Sparks Rush to Southeast New Mexico," OGJ, June 22, 1959.)

The new prospect is Carper Drilling Co. 1-A Federal MA, in Lea County, almost midway between Abo production at Empire and Lovington fields (see accompanying map). Location is NE NW of Section 31-17s-33e, 5½ miles southeast of Maljamar, 22 miles west of the Loving field and 30 miles east of Empire field.

Thick section . . . Operators logged top of the Abo reef at 8,406 ft., on elevation of 4,010 ft. At total depth of 8,775 ft. the bit had cut approximately 369 ft. of reef, of which the upper 219 ft. was oil-bearing. Some sections tested flowed oil up to 24 bbl. an hour.

First oil recovery . . . The first drillstem test covering a reef section was at 8,263-8,425 ft. Gas surfaced on the test but the flow was not gaged nor estimated. Recovery in 3 hours was 90 ft. of mud and 6,085 ft. of oil, with no water. Flowing pressure ranged from 470-1,770 psi. Shut-in pressure was 3,480 psi.

First oil flow . . . On test at 8,423-65 ft., gas surfaced in 1½ minutes. Oil surfaced in 64 minutes and flowed into pits for 30 minutes at the estimated rate of 15-20 bbl. an hour.

Maximum flowing pressure was 1,030 psi. A full string of oil was reversed out of the tubing.

On test at 8,464-8,525 ft., oil surfaced in 54 minutes, and flowed 24 bbl. in 1 hour.

Oil did not flow on subsequent test from 8,524-8,625 ft., but recovery was 7,900 ft. of oil and 500 ft. of mud.

On drill-stem test between 8,623-8,775 ft., open 4 hours, recovery in the pipe was a small amount of oil and gas-cut mud, 100 ft. of oil and 110 ft. of drilling fluid. Flowing pressure was down to 240 psi., and shut-in pressure read 2,185 psi. in 30 minutes.

Outcome of Carper Drilling Co.'s discovery prospect will depend upon further testing of the reef section. At last reports operators were drilling below 9,134 ft., on a 10,000-ft. contract. On the optimistic side, and based on estimated Abo reserves at Empire and Lovington, the 200-ft. reef section in 1-A Carper Federal looks attractive.

New fields found in Kansas basin

TWO NEW Pennsylvanian field discovery wells in northwestern Kansas' Kan-Neb basin were named last week. In Cheyenne County, R. G. Lawton completed 1 Liebbrant in C NW NE 36-3s-42w, 2¾ miles south of Rueb field to open South Rueb field. Production is from Lansing-Kansas City through perforations at 4,503-10 ft. The well pumped 72 bbl. in 12 hours.

In Thomas County, John O. Farmer completed 1 Brown in C SW NE 12-6s-35w, pumping 211 bbl. per day from Tarkio (Upper Wabaunsee) perforations at 3,739-43 ft. to open Lanisia field. Location is 10 miles southwest of Sappa Creek field and 3 miles southeast of previous drilling.

Michigan adds new oil-field prospect

One of Michigan's best new oil field prospects of the year, Robert Bond 1 Van Antwerp, SE SE SE 19-20n-10w, Burdell Township, Osceola County, flowed 10 bbl. oil natural from Dundee on preliminary 4-hour test.

Wildcat is located 10 miles north of the six-pay Reed City field. Dundee logged at 3,674 (−2,471) with pay from 3,676-83 ft., present total depth. Test carried 2,800 ft. oil in 36 hours in open hole, and flowed after casing had been set.

Bond, Mt. Pleasant independent, has an 800-acre block in the play.

Followup drilling slated for

Canada's Kotcho Lake, Petitot River

IT IS REPORTED that Gulf States Oil Co. of Canada has taken out British Columbia Government's drilling licenses and intends to start very shortly on followup drillers to both its Kotcho Lake and Petitot River gas strikes of last winter.

The new Kotcho Lake evaluation lies 3½ miles southeast of the 3 Kotcho Lake Slave Point gasser, while the new location in the Petitot River district is 2 miles southeast of the original discovery hole in that area. The 3 Kotcho Lake discovery hole flowed at the rate of 5,350 M.c.f.d. through a 20/64-in. choke with 2,156 lb. flowing pressure. At the time discovery was announced, Gulf States said that the well has excellent flow characteristics and indicates a major gas discovery of considerable importance of northeastern British Columbia and western Canada. The Petitot River strike was completed with a flow rate of 6,480 M.c.f.d. on a ⅜-in. choke with 2,214 lb. flowing pressure. Both wells are completed in the Middle Devonian formation.

The original Petitot River discovery well was drilled about 17 miles south of the Northwest Territories-B. C. border, 70 miles northeast of the settlement of Fort Nelson, about 575 miles northwest of Edmonton. The southern discovery, at Kotcho Lake, lies 50 miles east-northeast of Fort Nelson and about 60 miles southeast of the huge Petitot River find.

The new Kotcho Lake venture is Gulf States d-39-J (4) Kotcho Lake. At the first strike, absolute open flow is rumored to exceed that of the one established at the B.A.-Shell-Berland River D3 reef discovery well in Alberta.

The new site at Petitot River is Gulf States b-I-D (2) Petitot River, and is on quarter unit b, Unit I, Zone D, National Topographic Series Index Map 94-P-13 (ground elevation 1,520 ft.).

The Kotcho Lake location is on Permit No. 239, a tract of 107,129 acres in which Fargo Oils, Ltd., holds a 45% net carried interest. Petitot River, meanwhile, will be drilled on Permit No. 382, an area of 101,234 acres owned 25% each by El Paso Natural Gas and Gulf States and 50% by Fargo Oils, Ltd. That latter interest again is net carried.

Peter Bawden Drilling Co., Ltd., was awarded contract for the Kotcho Lake test, while Brinkerhoff Drilling Co. will drill the Petitot River venture. Both contractors are waiting for weather conditions to improve before starting drilling operations.

Weather pushes Lake Erie operation

IN ONTARIO, Place Gas & Oil Co. hopes to get its Lake Erie oil well on production before freezeup. There are six gas wells in the Walpole area tied in. The four other gas wells in the Dover area are in operation, giving the company 10 producers.

According to Eastern Gas and Oil Report in Port Credit, Imperial Oil is constructing a gathering station near Colchester field. This new Ontario producing area is being labled the most significant strike in the province since Petrolia itself. With the new 150 to 300-bbl. wells in this area, new development should spread next year in the Trenton and Black River Ordovician, extending from Manitoulin Island, along the escarpment to the Great Lakes. Next year should be Ontario's big year for exploration in and around Lake Erie.

Australian concessions granted

CONCESSION to drill in eastern Queensland, Australia, was granted Nortex Oil & Gas Corp. The Minister of Development and Mines at Queensland confirms the concession contains about 12 million acres, or 19,400 sq. mi. A wholly owned subsidiary, Nortex Australian Oils, Ltd., has been formed to explore the concession.

The concession is 100 miles wide, east-west, and 194 miles long. It borders Australia's northeast coast.

Nortex's concession is the last of unleased acreage in Queensland except for a block in the northwestern corner of the state. Nortex plans geological work on the lands in January. Phillips Petroleum Co. and Sunray Mid-Continent Oil Co. have concessions to the south. These two firms plan a wildcat next year on their land. Union Oil Co. of California and Kern County Land Co. will drill on their concession next year.

A NEW OIL FIELD stands out in midst of northeastern Mississippi and northwestern Alabama gas areas.

Black Warrior basin awakens

BY NEIL WILLIAMS
Associate Editor

SLUMBERING Black Warrior basin stretching across northeastern Mississippi and northwestern Alabama may be arousing after last week's oil discovery.

The discovery, by J. R. McLean and A. G. Hill in their 1 Brasfield-Boyd Unit wildcat in Monroe County, Mississippi, will be the first oil production in any of the basin's Mississippian-Chester sands, principal objective of an extensive wildcatting play from 1952 through 1953 into 1954.

The basin's only other oil production has been a single, short-lived well drilled by Magnolia Petroleum Co. (now Mobil Oil Co.) as the discovery well of the now abandoned New Hope field, less than 10 miles west in the same county. Completed in September 1953 in the deeper Knox dolomite formation of lower Ordovician age, it produced a total of only 7,800 bbl. of 35°-gravity oil before being shut down in June 1954. Two subsequent wells drilled at New Hope, one completed last November, have proved dry.

Production of the McLean-Hill discovery well is from the Carter sand, uppermost of the four most generally gas-productive Chester zones of the basin. While completion awaits installation of pumping equipment and tankage, full evaluation of the discovery cannot be made. Although the well, perforated at 2,563-87 ft., would not flow even after fracturing, it swabbed 21.5°-gravity oil at rates up to 15 bbl. per hour. Swabbing failed to lower the fluid level in the hole below 200 ft.

Drilled to 3,584 ft. in the Devonian, the well, with elevation of 400 ft., logged the Millerella lime at 2,412 ft., Carter sand at 2,560 ft., Sanders sand at 2,742 ft., Lewis zone at 3,215 ft., and the Devonian at 3,464 ft.

The discovery, 1½ miles south of Quincy, is less than 4 miles south of the old Amory gas area, Mississippi's first production of any kind. The field, opened in 1926, has been abandoned since 1937, except for gas-storage purposes. In its life, four gas wells were completed with production from the Hartselle zone in the upper part of the Chester series at depths of 2,400 ft.

Intensive exploration in Mississippi's portion of the basin did not begin until after the discovery of Muldon field at the beginning of 1952. Muldon, in the southwest corner of Monroe County, less than 20 miles southwest of the McLean-Hill oil discovery, has proved the basin's most important field so far. It is productive of gas and condensate from the Sanders sand at depths below 5,300 ft.

MISSISSIPPI

Field	County	Disc. Yr.	Discovery operator	Pay zone*	Pay depth (ft.)	Prod. wells dld.	Type prod.	Status
Aberdeen	Monroe	1953	Shell Oil Co.	Sanders	3,500	4	Gas	Producing
Amory	Monroe	1926	Amory Pet. Co.	Hartselle	2,400	4	Gas	Abandoned
Beans Ferry	Itawamba	1953	Crow Well Serv.	Evans	1,150	3	Gas	Shut-in
				Lewis	1,300	2	Gas	Shut-in
Coleville	Chickasaw	1953	Vaughey & Vaughey	Evans	2,400	1	Gas	Shut-in
Hamilton	Monroe	1954	Feazel et al.	Carter	3,360	1	Gas	Shut-in
Muldon	Monroe	1952	Union Prod. Co.	Sanders	5,300	8	Gas-Cond.	Producing
New Hope	Monroe	1953	Magnolia Pet.	Knox	4,750	1	35°-Oil	Abandoned
Okoloma	Monroe	1956	Pure Oil Co.	Carter	2,000	1	Gas	Shut-in
Siloam	Clay	1953	Carter Oil Co.	Millerella	8,600	2	Gas-Cond.	Shut-in†
Trebloc	Chicasaw	1953	Carter Oil Co.	Carter	4,300	2	Gas-Cond.	Producing

*Hartselle, Millerella, Carter, Sanders, Evans, and Lewis sands are members of Mississippian-Chester series. Knox is Cambro-Ordovician. †Discovery well abandoned. Second well drilled by Shell Oil Co.

ALABAMA

Field	County	Disc. Yr.	Discovery operator	Pay zone*	Pay depth (ft.)	Prod. wells dld.	Type prod.	Status
Belgreen†	Franklin	1952	Owen Heath	St. Genevieve	375	1	Gas	Abandoned
Falls City	Winston	1946	W. F. Peyton	Bangor	1,380	2	Gas	Shut-in
Fayette	Fayette	1909	Eureka Co.	Pottsville	1,400	40	Gas	Abandoned
Hamilton	Marion	1950	Harry Cullet	Lewis	1,850	4	Gas	Producing
Huntsville†	Madison	1902	New York-Alabama Oil Co.	Silurian	280	10	Gas	Abandoned
Jasper	Walker	1911	Pa. Oil & Gas Co.	Hartselle	1,800	3	Gas	Abandoned
Nauvoo	Walker	1956	Robert Schindler	Hartselle	1,880	1	Gas	Shut-in
Whitehouse	Marion	1957	Pearson et al.	Lewis	1,530	1	Gas	Producing

*Pottsville, Pennsylvanian; Bangor, Hartselle, Lewis, and St. Genevieve, Mississippian. †Not on map.

Eight wells have been productive with a total recovery so far of more than 24,572,558 M.c.f. of gas and 200,800 bbl. of liquid products.

In the wave of wildcatting which followed discovery of Muldon, first field found after Amory, eight additional fields were found on the Mississippi side of the basin. Except for the one Knox dolomite short-lived oil well at New Hope, all were productive of gas—most of them dry gas and relatively small volume. Only one of these (Trebloc, in Chickasaw County) has been produced.

Nearly all wildcats drilled had fair to good gas showings in at least one of the various Chester zones. Tight sand conditions and other complications conspired to prevent commercially productive completions in most of them.

Puzzling structural and geological conditions, coupled with hard-formation and other high-cost drilling difficulties limited market for gas, and somewhat questionable and low-compensating results proved discouraging to most operators. The play died down rapidly after early 1954, and since then only few scattered wildcatting attempts have been made. In these, until now, there has been only one bright spot, this being the drilling by Shell Oil Co. early in 1958 of an extension gas-condensate well a mile north of Carter Oil Co.'s abandoned discovery well of Siloam field in Clay County.

On the Alabama side of the basin, the search for oil and gas, no less prospective, has been less conspicuous. Oil and gas showings have been found in many wildcats in various parts of the basin, although only two areas, both in Marion County now, are commercially productive. These are at Hamilton, discovered in 1950, where there are four wells; and at Whitehouse, found in 1957, where one of two wells drilled is producing.

Productive history of Alabama's side goes back further than that of Mississippi's to the Huntsville area of Madison County, opened in 1902. That area, far northeast of more recent exploration and development, has long since been abandoned, but was productive of gas from Silurian at depths of 280 to 300 ft. in at least 10 wells.

So far, however, most of Alabama's listed fields are areas in which small gas wells have been drilled but abandoned or left standing at completion. Nearly all the drilling has been done with cable tools, and in many cases it has been carried on hapazardly, with little money, and with a limited amount of information—all of which has tended to create more or less uncertain or questionable results.

However, in the case of both Alabama and Mississippi it is general feeling that with better understanding of structural and geological conditions, development of special drilling practices to cope with the hard formations and other difficulties encountered, and adoption of such means as fracturing to open the tight potentially productive sands, the Black Warrior basin offers extensive prospects for more successful exploration.

Deep gas-condensate production for Texas

Deep gas-condensate production has been opened in the Arcadia area, 2 miles northwest of the widespread, multiple-pay Alta Loma field, in Galveston County, Texas Gulf Coast.

Discovery well, drilled by Union Oil Co. of California, tested for open-flow potential of 7,800 M.c.f.d. of gas. Condensate recovery is in the ratio of 13,800 cu. ft. of gas per barrel. Gravity of the liquid is 57°.

Pay zone is the Frio-Banfield sand, perforated at 10,738-50 ft. Total depth of the hole is 12,486 ft.

Location is on Union's L. B. Bishop Unit, a mile northeast of Arcadia townsite.

New well in Southeast Texas

A new well completed by Oil Reserves Corp. in the new Quicksand field of Newton County, southeastern Texas, gives this area its third Wilcox pay zone and its second oil producer.

The well, 2 Lindsey, flowed 197.39 bbl. of 40.1°-gravity oil per day through 12/64-in. choke from perforations at 10,094-10,112 ft. Flow was with pressure of 550 psi., and gas-oil ratio of 675 cu. ft. per barrel.

Quicksand field is 3 miles northeast of Bon Weir in the northeast part of the county.

New wildcat may be Australia's first gasser

First gas production in Australia is hinted at a wildcat in Victoria, on the south side of the land down under.

Frome-Broken Hill Co., Pty., Ltd., reports that its Port Campbell wildcat flowed gas during drill-stem test from 5,657 to 5,718 ft., total depth. The gas is being analyzed with more tests slated. Frome-Broken Hill is operated jointly by Standard-Vacuum Oil Co., B.P. Exploration, and Inter-State Oil, Ltd.

Sooner's McClain gets dual pay at important find

DUAL COMPLETION is reported at an important discovery in busy McClain County, South Central Oklahoma.

Hall-Jones Oil Co. and Sunray Mid-Continent Oil Co. 1 Morris-Scarborough, C SW NW 3-5n-2w, flowed 200 bbl. of oil in 10 hours on 24/64-in. choke from Hunton Siloro-Devonian perforations at 7,395-7,410 and 7,420-50 ft. From Viola Ordovician at 8,100-10 and 8,130-40 ft. it flowed 10 bbl. oil hourly.

Trizone production for Oklahoma well

PROLIFIC PRODUCTION is reported a three-zone completion in Oklahoma's Harper County.

Shell Oil Co. finished the 1 Taft-Lens in C SE NW 22-26n-26w, Laverne district, for 364 M.M.c.f.d. from Hoover, Tonkawa Pennsylvanian and Chester Mississippian. The Hoover gave up 300 M.M.c.f.d. from 4,244-85 ft., and 3½ bbl. condensate per million; Tonkawa at 5,470-5,520 ft. made 60 M.M.c.f.d. and 16 bbl. water per million; the Chester at 7,193 to 7,410 ft. made 4 M.M.c.f.d. with 15 bbl. condensate per million.

Important linkup in Oklahoma

An important linkup is reported at Sunray Mid-Continent Oil Co. 1 Wells in C NE SW 22-18n-7w, Kingfisher County, Central Oklahoma.

The well links North and Middle Dover fields. The Manning at 7,050-54, 7,058-61, and 7,069-79 ft. flowed 43 bbl. of oil in 10 hours on 20/64-in. choke.

Wyoming's Patrick Draw continues to expand

The most active area in Wyoming is at Patrick Draw and West Desert Springs in Sweetwater County, Green River basin.

New gages reported last week include 14 bbl. per hour from Almond Cretaceous at 5,039-59 ft. at El Paso 3 Unit, C NW SE 11-18n-99w. This well is about 1 mile southwest of the field discovery well in SE SW 1-18n-99w. It is also the southwest offset to 2 Unit in SE NE 11-18n-99w. That well flowed 1,135 bbl. per day to confirm the field discovery. Union Pacific Railroad Co. is spudding 13-31 UP in C NW SW 31-19n-98w, 1½ miles northeast of the discovery well of the unit. El Paso has located 4 Unit in C NW NW 13-18n-99w.

At West Desert Springs, 6 miles north of Patrick Draw, Texas National Petroleum Co. staked the fifth stepout well to the 1 Government-Withers Almond oil discovery in SW NE NE 32-20n-99w. The new well will be 1 mile southwest of Withers and is the 3 Government-Withers. Location is C SW SE 32-20n-99w. Flow lines are going in at 2 Withers in NE SE 32-20n-99w. This new producer flowed 20 bbl. per hour for 12 hours from Almond at 3,621-59 ft. The northeast offset to the discovery well of the field is Union Pacific 34-29 UP in SE SE 29-20n-99w. Tests continue after flow of 129 bbl. in 19 hours on 19/64-in. choke. Union Pacific is nearing Almond at a southeast offset to the discovery. Pubco Petroleum is drilling below 3,906 ft. at a northeast stepout at 3-28M in SW SW 28-20n-99w.

Northwest offset flows oil at West Desert Springs

In Wyoming's Green River basin, Union Pacific Railroad Co. 34-29 UP, SE SE 29-20n-99w, Sweetwater County, flowed 130 bbl. of oil in 18 hours on 16/64-in. choke from Almond Mesaverde Cretaceous perforations at 3,462-87 ft. This is the first gage reported at any of the offset wells going around West Desert Springs, opened a few weeks ago at Texas National Petroleum Co. 1 Government-Withers in NE NE 32-30n-99w. That well, one of the drilling highlights of the year, flowed 300 bbl. per day on 18/64-in. choke on completion.

Illinois adds one new pool, eight extensions to drilling list

ONE NEW OIL POOL, Siloam in Brown County, was discovered in November.

There were eight extensions to pools as follows: two to Kellerville pool in Adams County, and one each to Mt. Auburn Consolidated in Christian County, Clay City Consolidated and Sailor Springs Consolidated in Clay County, Main Consolidated in Crawford County, Dale Consolidated in Hamilton County, and Waggoner in Montgomery County.

A total of 213 wells were completed in November, an average of about 43 a week for the 5-week period. The November completions include 90 oil wells and 3 gas wells, or a success ratio of about 44%. In addition, eight wells that had previously been completed as dry holes were worked over and recompleted as oil wells.

The discovery of Siloam pool in Brown County, following by only a few months the discovery of Kellerville pool about 2½ miles to the northwest in Adams County, has stimulated a great deal of interest and activity in this heretofore nonproductive area of Illinois. The discovery well, the Charles Eager, 1 W. L. Davis, in 8-25-4w, Brown County, was completed for an initial production of 530 bbl. of oil a day at a total depth of 635 ft. At least five dry holes had been drilled within a half mile of the discovery well by the end of November, including a well only 660 ft. south of the discovery well. From October 26 to November 25, the Department of Mines and Minerals issued 27 permits to drill for oil or gas in Adams and Brown counties.

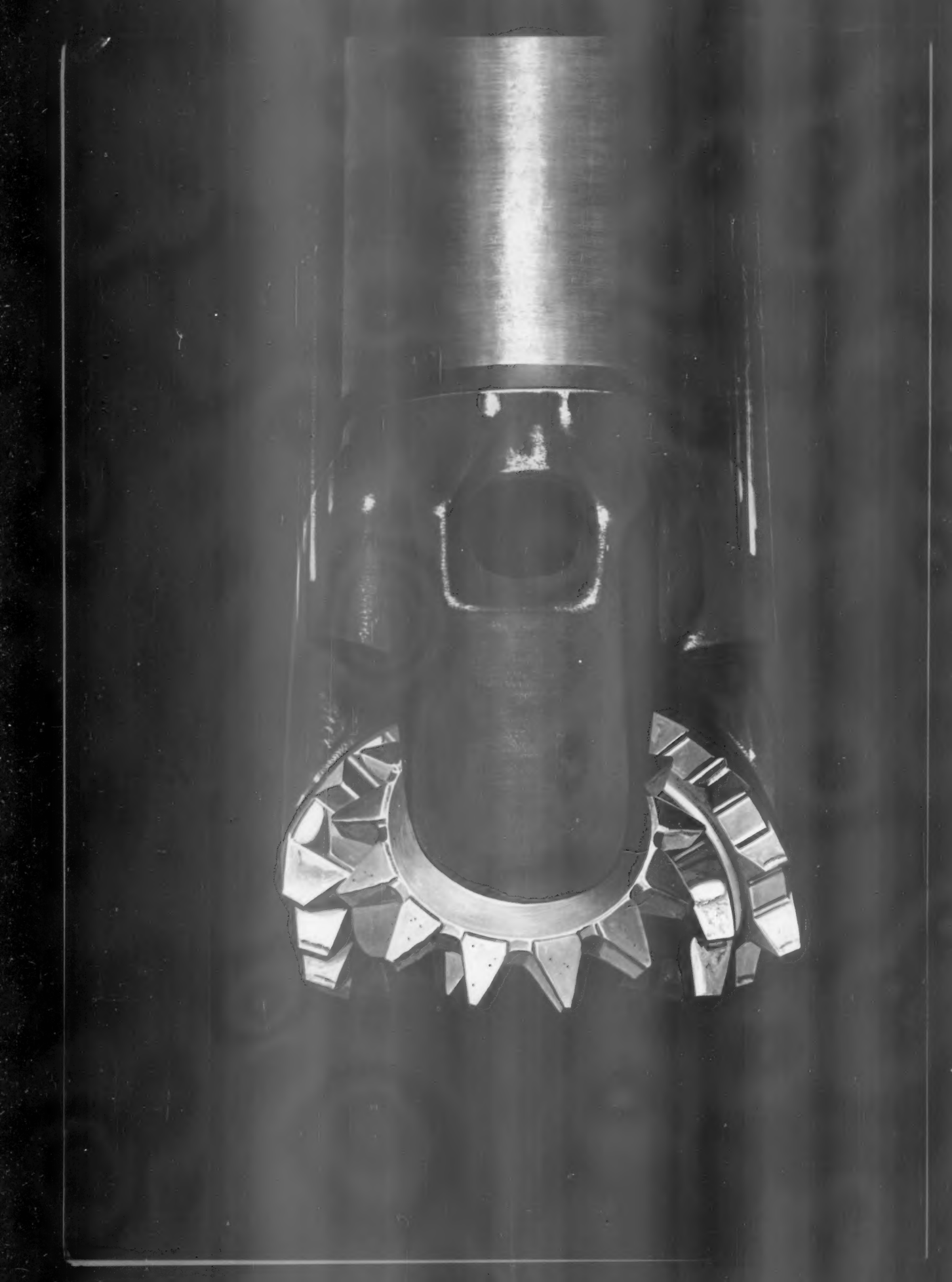
Interest in the oil possibilities of deeper rock strata in the Illinois basin continues. Included in the November completions is the George Zicos, 31 Naomi L. Podolsky well in 28-25-7c, Wayne County. This well was drilled to a total depth of 4,225 ft. to test the Warsaw limestone. It was plugged back to 4,000 ft. and completed as a small oil producer in the Salem limestone.

In White County in 31-3s-8c, Nation Oil Co. deepened the 2 W. P. McIntosh well to 4,191 ft. and completed it as an oil well in the Harrodsburg formation. The well had been completed in 1940 as a dry hole at a total depth of 3,395 ft. Estimated production for Illinois for November is 6,794,000 bbl. of oil.

LIBYA

Dynamite for shot-firing being carried across country by camel train. BP Exploration Company (Libya) Limited is now searching for oil over six concession areas in Tripolitania, Cyrenaica and the Fezzan.

BP



ALMOST EVERYBODY IS USING REED BITS

and here's why . . .

In field after field, the new Reed Y bits are performing so well that the demand is exceeding our present plant capacity. To remedy this situation, we are expanding our research and production facilities and will soon be in much better position to supply your needs.

We now have available all the most popular sizes and types and are adding new sizes and types to our inventory as fast as possible. However, each new size and/or type requires many hundreds of hours of research, engineering, and testing. When we release a bit to the field, you can rest assured that it will dig with the best of them.

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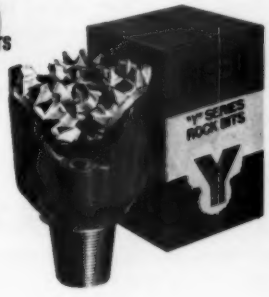

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	Stream	Weight Lbs./Gal.	Flow, GPM	Per Cent Solids by Weight	Sp. Gr. Solids	Per Cent Barite by Weight	Barite Lbs./Min.	Clay Lbs./Min.	Barite Recovery Per Cent	Clay Rejection Per Cent
Chambers County, Texas ...	U.F.	18.4	7.9	69.9	3.90	85.6	86.9	14.6	87.3	67.6
17.2 #/Gal. mud 3 Clones..	O.F.	8.75	60.0	8.2	2.94	29.7	12.8	30.5		
S.G. Bar = 4.26 (2/6/58)										
Chambers County, Texas ...	U.F.	17.25	8.1	69.4	3.87	84.4	81.9	15.1	90.7	69.0
17.2 #/Gal. mud 3 Clones..	O.F.	8.75	61.5	7.8	2.82	20.0	8.4	33.6		
S.G. Bar = 4.26 (2/6/58)										
Vermilion Parish, La.	U.F.	20.0	3.0	78.0	4.06	98.0	45.8	1.0	85.5	89.8
18.1 #/Gal. mud 1 Clone ...	O.F.	8.8	19.1	9.87	3.14	47.0	7.75	8.75		
S.G. Bar = 4.11 (3/5/58)										
Cameron Parish, La.	U.F.	18.8	10.7	72.0	3.78	83.8	121.1	22.4	82.7	69.5
13.3 #/Gal. mud 4 Clones..	O.F.	9.0	71.4	11.9	2.89	33.4	25.5	51.0		
S.G. Bar = 4.20 (3/13/57)										
Matagorda County, Texas ...	U.F.	19.4	8.3	72.4	3.91	89.5	104.2	12.3	86.5	65.2
15.0 #/Gal. mud 4 Clones..	O.F.	8.7	66.7	6.7	3.00	41.1	15.9	23.0		
S.G. Bar = 4.20 (3/15/57)										
Terrebonne Parish, La.	U.F.	18.8	6.3	74.4	4.05	93.8	82.5	5.5	84.4	76.0
14.0 #/Gal. mud 2 Clones ..	O.F.	8.9	32.0	11.5	3.09	47.2	15.4	17.4		
S.G. Bar = 4.23 (7/6/56)										
Calcasieu Parish, La.	U.F.	19.6	3.8	74.8	4.18	96.8	53.8	1.9	84.5	90.0
17.1 #/Gal. mud 1 Clone...	O.F.	9.1	20.0	14.8	2.95	36.5	9.8	17.1		
S.G. Bar = 4.26 (5/17/56)										

U.F. = Underflow; Barite Slurry Returned to Mud.
O.F. = Overflow; Clays and Water Rejected to Wash.

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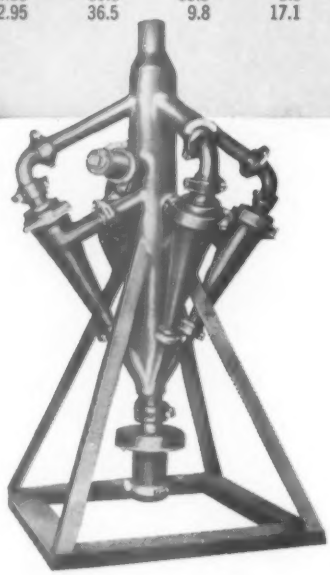

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Ohio well tested in Muskingum County

In Ohio, on a 8-hour test after fracture, Hartley & Grumbell 2 A. C. Boehler, Section 3, Hopewell Township, Muskingum County, made 100 bbl. oil with a gas volume of 197 M.c.f.d.

The operators reported the Clinton sand at 3,252-85 ft. had 1,000 ft. of oil and 59 M.c.f.d. natural.

Not to be overlooked in the same field is a ½-mile extension, Natol Corporation 1 J. M. Grimes, Lot 22 3rd Q., which logged the Clinton at 3,256-97 ft. and tested 40 barrels oil per day with 848 M.c.f.d. of gas after fracture.

The gas play east of Richland pool in Swan Township, Vinton County, continues to show good results as another sizable gasser was completed.

Roberson-Williams 1 Fred Mitchell, Section 15, gaged 1,100 M.c.f.d. natural from the Clinton sand at 2,749-63 ft. The gage 4 days after fracture was 13,800 M.c.f.d. with rock pressure of 840 psi.

• Also, two completions by Darrell Blanton, 1 Roscoe Campbell, Section 22 and 2 Mike Kessler, Sectiton 16, fractured to 2,210 M.c.f.d. and 6 M.M.c.f.d. respectively with rock pressures of 830 and 875 psi.

Big drilling week for California gas fields

ONE NEW FIELD discovery and three significant development and extensions tests sparked the North Central California gas search recently. The successes included:

...**Glenn County.** Sunray Mid-Continent Oil Co. was credited with a new field discovery in a wildcat drilled about 2½ miles northwest of the nearest producer in the Willows gas field. The Sunray well, 1 Sunray - McCulloch - Coast - Von Bargen, found new production in an undisclosed interval around 7,100 ft. The stabilized flow rate was 1,275 M.c.f.d. through a 3/16-in. choke. The area is described as the Artois area.

At the neighboring Beehive Bend gas field to the south, General Petroleum Corp. completed one of the biggest gas wells in the state this year. The GP well, 1-A Sec. 60 Unit, was completed in an interval at 3,084-3,137 ft. for a maximum flow rate of 16,900 M.c.f.d. through a choke. It tested for 7,850 M.c.f.d. through a 48/64-in. choke. This well is located on the extreme north edge of the field only about ¼ mile south of the most southerly Willows gas field well.

...**Sacramento County.** Standard Oil Co. of California completed as a big producer an extension test about ½ mile north of the nearest well in the Thornton-west gas field. The Standard well, 5 McCormack-Williamson, was completed in selectively perforated intervals in two zones. The upper zone between 3,560-3,720 ft. tested at a rate of 6,714 M.c.f.d. through a ½-in. choke. The lower zone between 7,910-65 ft. tested for 5,200 M.c.f.d. through a 5/16-in. choke. The well was shut in with 3,132-psi. pressure against the packer.

...**San Joaquin County.** Standard Oil Co. of California gave this county's Vernalis gas field its most southwesterly producer with a well in SE NW 26-3s-6e. The well was completed at an undisclosed rate from intervals at 3,810-20 ft. and 3,844-80 ft.

Production extended in California Kern

Production in the Belgian Anticline, Kern County, was successfully extended 1,000 ft. north of the nearest producer by Ohio Oil Co. The well was completed in an interval between 5,822-90 ft. pumping at a rate of 264 bbl. daily of 35.5°-gravity crude on a 4-hour test.

Reserve pool stretches in California drilling

Richfield Oil Corp. successfully extended production one location southwest of its Reserve pool discovery in Kern County's Wheeler Ridge-Windgap area. The well, 27-36 KCL L, was the first offset to the discovery made last September. The offset found the upper Miocene pool between 5,531-5,703 ft. It was completed flowing 279 net bbl. of 21.8°-gravity crude through a 1½-in. choke.

California test dually completed

Shell Oil Co. dually completed an extension test on the southwest edge of the Bridge Pool area, South Mountain field in Ventura County, as a 1,300-bbl.-daily well. The slant-drilled well was completed in the prolific Pliocene pool in zones at 8,413-9,004 ft. and 9,939-10,785 ft. The upper flowed 710 bbl. daily of 35.7°-gravity crude through an 18/64-in. choke. The lower was making 657 bbl. daily of 35°-gravity crude through a similar-sized choke. With a choke of 20/64-in., the upper flowed 837 bbl. daily and the lower 527 bbl. daily several days after the completion.

Pennsylvania gets first Cambrian gas

FIRST commercial Cambrian gas production in Pennsylvania was established at a wildcat in southwestern Erie County. The discovery, first such production east of Kansas, is Russell McConnell 1 Borst in Conneaut Township.

The well flowed at the rate of 400 M.c.f.d. from the Gatesburg Upper Cambrian between 5,806 and 5,910 ft. Ten wells have been drilled to or through this horizon in the state, but most of them have had only salt water with an occasional gas show.

Second gasser for Alaska's Kenai Unit

Union Oil Co. of California announced the second gas well recently completed on the 61,468-acre Kenai Unit on the Kenai Peninsula was perforated between 4,834-58 ft. It is about 1 mile northeast of the discovery well.

Mississippian pool is opened in West Texas

Mississippian production has been opened in central Dawson County, West Texas, 2½ miles southwest of Lamesa, and 1 mile south of Spraberry production in the Huddle Manning field.

Amerada Petroleum Corp. 1 R. C. Moore flowed 286 bbl. of 38° oil a day on potential test through 24/64-in. choke, from perforations in the lower Mississippian at 12,280-11,322 ft. On elevation of 2,949 ft., 1 Moore logged the Spraberry at 8,276 ft., Canyon reef at 9,950 ft., Mississippian at 11,242 ft., and the Ellenburger at 12,052 ft.

While drilling, a test in the Fusselman section at 11,595 - 11,705 ft. flowed 22 bbl. of oil in 1 hour and 50 minutes, with no water reported. Following the drill-stem test, perforations at 11,682-11,698 ft. were swabbed for 69 bbl. of new oil plus 174 bbl. of sulfur water in 13½ hours. Operators squeezed the section and plugged back to 11,383 ft. for completion.

Location of the well is approximately SE SW of Section 14, Block 36, T5N, T&P Survey. It is separated from the Huddle Manning field by an 8,206-ft. dry hole.

West Central Texas well has heavy flow

A field-development well in southwestern Runnels County, West Central Texas, has flowed oil at the estimated rate of 100 bbl. an hour on drill-stem test.

The heavy flow was reported at Karl Hoblitzelle 1-A S. W. Horton, 3 miles southeast of Norton, in Section 12-H, A. Massey Survey. Operators ran a drill-stem test of the Goen limestone (Upper Strawn age) at 4,317-49 ft. Gas surfaced in 2 minutes and 45 seconds and oil in 5½ minutes, flowing into pits at the above rate. There were no gages made on the flow. Another test, at 4,332-39 ft., recovered 3,767 ft. of oil and 282 ft. of sulfur water.

No. 1-A Horton is in the North Motley field, which produces gas from the Odom limestone and oil from the Palo Pinto and Goen. The Horton test is the second well to produce from the Goen lime, and is a northwest offset to the same operator's 1-A Lucius Evans, recent Goen lime discovery in the field. The discovery was finaled for 138 bbl. of oil, on the pump, from pay at 4,321-25 ft.

Discovery wells

CALIFORNIA

Glenn County: Sunray Mid-Continent Oil Co. 1 Sunray - McCulloch - Coast - Von Bargen, SE NE 11-20n-3w, 1,275 M.c.f.d., ⅛-in. choke, TD 7,447 ft. (New gas-field discovery 2¼ miles northwest of Willows gas field).

COLORADO

LaPlata County: Benson-Montin-Greer Drilling Co. 1 Southern Ute, N½ NW SW 35-33n-12w. IPP 25 BOPD, 39°, Dakota 3,665-86 ft. TD 3,704 ft. Dakota discovery, new field.

Mesa County: Union Oil Co. of California 1 Buzzard Creek, W½ NW NW 12-9s-93w. IPF 4,200 M.c.f.d., Mesaverde discovery, new field. TD 8,562-66 ft.

Montezuma County: Phillips Petroleum Co. 2 Desert Canyon, SE SE SE 11-34n-20w. IPF 280 BOPD, ¾-in. choke, 41°, GOR 1,632:1, TP 60 psi., Paradox 5,902-47 ft. TD 6,090 ft. Paradox discovery, new field.

Morgan County: Ozark Oil Co. 1 Voelli-Christensen, OWWO. NE SW 33-5n-59w. IPP 10 BOPD, plus 25% b.s. and mud. "D" sand discovery, new field. TD 6,122 ft.

Richard F. Shaheen 1 Poe, S NW NW 12-3n-59w. IPF 6 BOPD, 1,400 M.c.f.d., 5,835-43 ft. "D" sand discovery, new field. TD 5,960 ft.

NEBRASKA

Banner County: Kimbark Exploration Co. 1 Grant, C NE SW 29-19n-55w. IPP 210 BOPD, "D" sand discovery, new field. TD 5,595 ft.

Pan American Petroleum Corp. 1 Cross "D," C SW NW 3-18n-57w. IPP 85 BOPD, 60% water, "J" sand discovery, new field. TD 6,666 ft.

Cheyenne County: HLM Drilling Co. et al. 1 Frei, C NW NW 32-16n-52w. IPP 250 BOPD, and 5% water. "J" sand 5,442-46 ft., "J" sand discovery, new field. TD 5-513 ft.

Kimball County: Miracle-Fifer Drilling Co. 1 Evertson, C SW NE 30-16n-56w. IPP 40 BOPD, 245 BWPD, "J" sand discovery, new field. TD 6,743 ft. perfs. 6,663½-66½ ft.

NEW MEXICO

San Juan County: Permian Oil Co. 1 Knight, NE NE 5-30n-13w. IPF 4,017 M.c.f.d., ¾-in. choke, Dakota discovery, new field. TD 6,300 ft.

E. P. Campbell 1 E. A. Hanson "A," OWDD, NE NE 5-25n-10w. IPF 2,471 M.c.f.d., ¾-in. choke. Graneros-Dakota discovery, new field. TD 6,542 ft. OTD 5-755 ft.

SOUTHWEST TEXAS

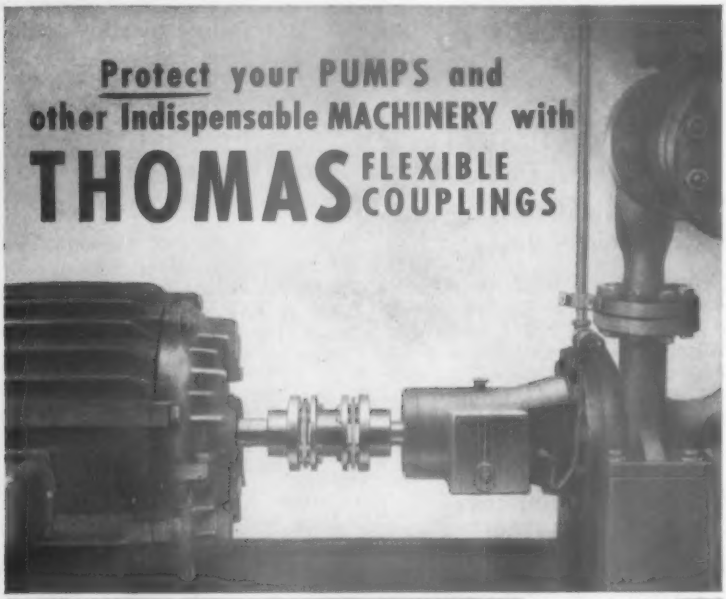
Maverick County: Continental Oil Co. 40-1 N. J. Chittim, Section 40, Block 6, I&GN Sur., A-646. IPP 7 BOPD, 37.2°, perf. 1,906 ft., San Miguel-5, TD 1,953 ft. New pay in Sacatosa field.

McMullen County: B. W. Foss, 1 Frost National Bank, Section 56, J. Breitling Sur., A-646, 6 miles southwest of Whitsett, in abandoned Crowther field area. IPP 5 BOPD, open hole 490-97 ft., Mirando sand. TD 497 ft. Revives Crowther field.

Ramada Oil & Gas Co. 2 Hagist Ranch, Section 481, J. P. Ellis Sur., 23 miles south of Tilden. AOF 2,400 M.c.f.d., GLR 37.9 M.c.f. per bbl., 64.2°, shut-in TP 2,339 psi., perf. 6,683-93 ft., Wilcox-Slick sand. TD 6,755 ft. New field in West Alta Loma area.

Starr County: Sun Oil Co. 2-D Montalvo, Share 9, Los Retaches Grant, 35 miles northeast of Rio Grande City. IP 93

(Continued on page 130)



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Gibson Helps Guide Pacific

. . . to another record year. The firm's executive vice-president paints a bright picture for Western Canada.

PACIFIC Petroleums, Ltd., which racked up the greatest growth in its 20-year history during 1958 when many oil companies were retrenching, will almost triple its net this year.

The company expects to net around $3.5 million for 1959, compared with $1.2 million during 1958.

Predicting the record year is Kelly H. Gibson, executive vice president of Pacific Petroleum since July 1. A lot of Pacific's success during that 2-year period has been due to Gibson, who joined the firm in November 1957.

Gibson gave up more than 20 years' service with a major company to go with Pacific. He had been with Gulf Oil Corp. since 1935 when he switched to Pacific as vice president of production. Gibson calls the switch from Gulf to Pacific a "hard decision."

"After a great amount of thought and advice from friends, I decided to make the move. I felt that a real challenge for me was the job that needed to be done in the smaller company. Pacific Petroleums was just starting to deliver large volumes of gas to Westcoast Transmission Co. They had just acquired Merrill Petroleums. Their gas and oil production for the first time was of sufficient size to afford a proper production department," Gibson says.

Kelly H. Gibson
. . . industry to reach new levels

Background . . . Gibson was born in Broken Arrow, Okla., in 1912. He graduated from the Oklahoma Military Academy at Claremore, where he earned letters in football and boxing.

At the age of 20, Gibson went to work as a roughneck, laborer, and trucker for contracting firms in Oklahoma and Kansas.

He started to work with Gulf in April, 1935, as a roustabout in Chase, Kans. He became a lease pumper in 1937, a production clerk in 1940, and went into military service in 1943. He returned in 1946 as a well tester, in 1947 became assistant production foreman, rose to production foreman in 1949, a district superintendent in 1950, area production manager in 1952, and zone production manager in 1957.

Before the war, his work took him from Kansas to Illinois, Indiana, and Michigan. Right after the war he took a production training course at Seminole, Okla., consisting of working in a machine shop, a warehouse, and in the purchasing department. Part of the time was spent repairing bottom-hole pumps and other equipment in a pump shop.

When he finished the training course, Gibson worked as a well tester doing wire line work and bottom-pressure work in the engineering department. After several additional months on a rotary rig, he was transferred to Michigan as assistant production foreman.

Gulf was engaged in drilling some wells along Lake Huron around Saginaw Bay. Gibson supervised seven strings of cable tools operating there. None of the work was "offshore" but a few of the wells were drilled beyond the "meandering" line, the indefinite area between the lake and the shore.

He went to Edmonton as production foreman and worked in the Redwater field. He later became area production manager and finally zone production manager when British American took over Gulf's Canadian producing properties in July, 1956. His zone covered the area west of the Saskatchewan-Alberta border. He was with British American, a 58% Gulf-owned affiliate, a little more than a year when he joined Pacific.

Outlook . . . It's apparent from Gibson's career that he took a lot of experience to Pacific Petroleums. He also took a fair share of optimism along. Here's how he sees things:

"We believe that the Canadian oil and gas industry is on the verge of another major breakthrough, comparable to that which took place in the decade following the first discovery of major oil fields in 1947.

"It has become increasingly clear that the shortage of markets, which has held back the oil portion of the

▶▶▶ Personals

Gerald L. Kempe, senior production engineer in reservoir engineering for Humble Oil & Refining Co., Midland, Tex., has been transferred to Andrews, Tex., where he will be senior production engineer specializing in drilling practices, automation, and artificial lift.

Robert J. Bradley, president of Producing Properties, Inc., Dallas, has been elected chairman and chief executive officer. **Mac D. Oliver, Jr.,** will succeed Bradley as president. **Virgil B. Harris** has been named executive vice president, a new position.

James E. Stones, formerly with Superior Oil Co. in Los Angeles, has joined Monsanto Chemical Co.'s Lion Oil division in Midland, Tex. **Cecil R. Rives,** formerly with Kilroy Co. of Texas, has joined Lion Oil in Houston. Both will be in the production and exploration department.

J. E. Lytle has been named superintendent of the geological department for Union Producing Co. In other appointments in this department, **W. C. Hayes,** geologist, has been promoted to assistant superintendent in charge of the development section; **B. B. Gibbs,** geologist, becomes assistant superintendent in charge of the reserves and valuation section; and **J. T. Scopes** has been named consulting geologist.

R. E. Collins, chief process engineer for Neches Butane Products Co., has been promoted to superintendent of production. **F. R. Jelinek,** chief engineer, has been named superintendent of maintenance and engineering. **H. D. Maples,** chief chemist, has been appointed superintendent of technical services. Collins will be succeeded by **N. J. Vaglica,** assistant chief process engineer. **H. W. Kingsberry,** assistant chief engineer, will succeed Jelinek. **J. N. Wilson,** assistant chief chemist, will succeed Maples.

industry for the past 2 years, will be overcome in the near future. The recent report of the Royal Commission on Energy has recommended that government action be taken to dedicate a large part of the Eastern Canadian market to western crude, unless the oil industry itself can almost double the existing market within the next 18 months."

Gibson adds that "the western Canadian oil producer can look forward to a subsequent increase in markets in the next few years, and inevitably this will mean an expanded program of exploration and production activities."

Here's how Gibson views the natural-gas situation:

"The western Canadian natural-gas industry presents a very bright picture. There is a steady and growing market within Canada and the U. S. and it has been estimated by the energy commission that the ultimate reserves of gas in Western Canada will exceed 300 trillion cubic feet. Thus, we have a very healthy situation where a steady increase in supply is counterbalanced by a constantly growing market.

"Two major pipelines now transport western Canadian gas to Eastern Canada and to British Columbia and the Pacific northwest states. Three applications to export additional quantities of western Canadian gas and to build new pipelines are now pending before governmental boards. I am sure that the necessary authorizations will be forthcoming and that this will activate a new period of major pipeline construction and exploration and production activities.

"I think it can be safely said that the western Canadian oil and gas industry has successfully weathered the recession of the past 2 years and now is poised to reach new levels of progress."

David R. Hammel has been named technical coordinator in the plastics division of Enjay Co., Inc. **Frederick T. Philips** has been appointed manufacturing coordinator, plastics division. Both will headquarter in New York.

M. F. (Ted) Bear, Wichita independent operator and consulting geologist, has been elected president of the Kansas Geological Society. He succeeds **Elbie McNeil,** Nadel & Gussman. Other new officers are **Gerald W. Pike,** Pickrell Drilling Co., vice president; **Jack Firstenberger,** Phillips Petroleum Co., secretary - treasurer; and **Charles F. Roach,** Gulf Oil Corp., a director.

A. J. Greenbaum, formerly with Time Petroleum Co., has organized a new Wichita exploration company, Future Petroleum Co.

Dode Graham, formerly assistant division manager of Champlin Oil & Refining Co.'s Omaha marketing division, has been promoted to division manager. He succeeds **Don F. Clugston,** who has resigned.

Steve W. Shambaugh, vice president and general manager of Reading & Bates Drilling Co., Ltd., has been elected president of Canadian Association of Oilwell Drilling Contractors. He succeeds **F. T. Glasscock,** Pennant Drilling Co. **R. H. Bullied,** Cascade Drilling Co., Ltd., is vice president of the association. New directors are **W. Booth,** Commonwealth Drilling Co., Ltd., and **W. R. Weibe,** Regent Drilling Co., Ltd.

Marvin H. Raven, assistant compressor station superintendent in Redfield, Iowa, for Northern Natural Gas Co., has been promoted to superintendent there. **Roscoe Q. Rizley,** formerly in Ogden, Iowa, has been transferred to North Branch, Minn., as district superintendent.

Dale Rodman, Ohio Oil Co., has been elected president of the Pacific Coast Oil Scouts and Landman's Association. Other new officers are **Lloyd Bosworth,** Standard Oil Co. of California, vice president; **Bill Horsley,** Richfield Oil Corp., secretary-treasurer; and **Barney Barnard,** Richfield, editor.

Jim Jamieson, Gulf Oil Corp., has been elected chairman of the Kansas section of AIME's Society of Petroleum Engineers. Other new officers include **Tom Bush,** Lane-Wells Co., vice chairman; **Bill Montgomery,** Cities Service Oil Co., vice chairman for eastern Kansas; **Jim Curry,** Continental Oil Co., secretary; **Bob Allison,** Kewanee Oil Co., treasurer; and **Charles Rodd,** Fourth National Bank of Wichita, director.

Howard Jetton, Atlantic Refining Co., has been named 1960 president of the Permian Basin Crude Oil Representatives Association. He succeeds **Dick Booker,** Cities Service Oil Co. Other new officers are **H. H. Kauerz,** Indiana Oil Purchasing Co.; **R. L. McPherson,** MacWood Corp., secretary-editor; and **J. L. Pipes,** Gulf Oil Corp., treasurer. **Robert L. Denton,** Mobil Oil Co., was reelected a director of the International Oil Scouts Association. **N. R. Griffin,** Permian Oil Co., was named alternate director.

▶▶▶ Personals

SPRATT

J. Grant Spratt, president of Triad Oil Co., Ltd., has been named a director of Alberta Gas Trunk Line Co., Ltd. He will represent producer and processor interests on the board. Spratt succeeds **J. A. Armstrong,** Imperial Oil Ltd., who was recently transferred to New York. Spratt is a former president of Trans Mountain Oil Pipe Line Co., Ltd. He was named executive vice president of Triad Oil in 1955.

G. F. Johnson, formerly subdistrict geologist for Magnolia Petroleum Co. in Lake Charles, La., has been appointed district geologist in Houston for Mobil Oil Co. **A. M. Field,** Magnolia's senior geophysicist in Houston, has been named Mobil Oil Houston district geophysicist.

J. P. O'Connor, district geologist in Tyler, Tex., for Tidewater Oil Co., has been transferred to Houston as assistant division geologist. **George G. Wise,** Lafayette, La., will succeed O'Connor in Tyler. **Harry L. Frank,** geologist in the Houston office, has been named district exploitation geologist in Lafayette, succeeding Wise.

O. W. Crisman has been appointed manager of Delhi-Taylor Oil Corp.'s McAllen Tex., production district. **W. S. McCready** has been named production supervisor in Dallas. Crisman was manager of Gulf Oil Corp.'s Morgan City, La., offshore district before joining Delhi-Taylor. McCready headed International Petroleum Co.'s petroleum engineering department in Talara, Peru, before joining the company.

A. G. Stewart, manager of the Ioco refinery of Imperial Oil Ltd. in Vancouver, has been named manager of the company's Regina refinery. He succeeds **Ward O. Longworthy,** who has retired. **H. L. Cavanagh,** plant superintendent in Vancouver, will succeed Stewart there. **S. V. Antenbring,** head of the construction section, engineering division, in Sarnia, Ont., has moved to Vancouver as superintendent, succeeding Cavanagh. **J. Guthrie,** mechanical superintendent at the Regina refinery, will succeed Antenbring in Sarnia. Stewart was manager of Imperial's Winnipeg refinery before moving to Vancouver in 1955.

Personals

Robert D. Bent has been elected vice president and a director of Atlantic Refining Co. He will continue as general manager of the manufacturing department. Bent succeeds **W. F. Stroud** on the Atlantic board. Stroud had continued as a director after his retirement in June. Bent has been with Atlantic since 1935. He had been manager of the manufacturing technical service department and assistant general manager of manufacturing before his appointment as general manager earlier this year.

BENT

F. E. McPhillips, manager of Richfield Oil Corp.'s land and lease division, has been named assistant general manager of the production department, a new position. **E. M. Benson, Jr.,** supervisor of joint and foreign operations, will take on additional duties as land and lease division manager.

H. G. Wesberry, Tidewater Oil Co., has been elected 1960 chairman of the Permian basin chapter of API's Division of Production. Other new officers include **E. L. Cralle,** Cities Service Oil Co., first vice chairman; **Cullen Akins,** William Cameron & Co., second vice chairman; and **John J. Fletcher,** Pan American Petroleum Corp., third vice chairman.

Charles B. Palmer, supervisor of tariffs for Interstate Oil Pipe Line Co., has been promoted to manager of oil movements, a new position. He will continue to supervise tariffs and crude scheduling and will take on additional duties as dispatching supervisor. **J. T. McHughes,** formerly chief dispatcher, recently retired.

R. O. (Bob) Wilson, terminal superintendent for Kaneb Pipe Line Co. in Geneva, Neb., has been promoted to manager of terminals in Yankton, S. D.

R. B. Cornell and **W. B. Roper** have been named regional staff geophysicists in Mobil Oil Co.'s Midland, Tex., division exploration department. **R. S. Rector** has been named regional staff geologist in Midland. Cornell was formerly senior geophysicist for Magnolia Petroleum Co. in Midland. Roper was gravity supervisor in Dallas for Magnolia. Rector was geologist in San Antonio, Tex.

Harold J. Fitzgeorge, formerly Wichita Falls, Tex., district geologist for Magnolia Petroleum Co., has been appointed Midland, Tex., district exploration superintendent for Mobil Oil Co. **Glen W. Barb,** formerly Magnolia's Vanderbilt, Tex., district petroleum engineer, has been named Midland district producing superintendent. In other Mobil Oil Midland district appointments, **J. C. Eley,** former Magnolia Midland district geophysicist, will be district geophysicist. **Morty C. Vinson,** staff geologist in Midland, will be district geologist, and **Fred A. Dulaney,** former district land man in Abilene, Tex., has moved to Midland in the same capacity. **C. A. Freeman,** formerly superintendent of Magnolia's Seeligson natural gas district, has been named Midland district engineer. **B. A. Tefertiller,** formerly district material foreman in Kermit, Tex., for Magnolia, has been named Midland district material supervisor.

E. D. Brockett has been elected executive vice president of Gulf Oil Corp., effective January 1. He has been president of British American Oil Co., Ltd., since 1958, and before that served as Gulf's coordinator of production on a world-wide basis. Brockett joined Gulf in 1934 as a roustabout in West Texas. Since that time he has held such posts as production manager for Mene Grande Oil Co. in eastern Venezuela and Gulf vice president in charge of the Houston production division. He has been a Gulf vice president since 1955.

C. J. (Pete) Hale, Jr., district foreman for Interstate Oil Pipe Line Co. in Brookhaven, Miss., has been promoted to assistant superintendent of the Brookhaven district.

Wilfred G. Lauderdale, engineer in Fort Worth for Service Pipe Line Co., has been promoted to schedule coordinator in Baytown, Tex. He will be responsible for scheduling products through the Bayou Pipe Line System.

A. E. Collins, manager of Vickers Petroleum Co.'s production department, has been named vice president of production. **L. W. Goudy,** formerly assistant exploration manager, has been named vice president in charge of exploration. Both will headquarter in Denver. Collins has been with Vickers since 1954 and has been production manager since 1955. Goudy joined the company as chief geologist in 1956. He was named assistant exploration manager earlier this year.

Deaths

Dwight G. Vedder, 69, California independent, died December 8 in Honolulu while en route to the U. S. from Australia. Vedder was discoverer of California's Mt. Poso, Kernbluff, and Dominion fields. One of the state's most prolific oil bearing formations, the Vedder, was named after him. Vedder was with Standard Oil Co. of California before becoming an independent.

H. L. Browning, 63, Centralia, Ill., independent producer, died December 7 in a Centralia hospital.

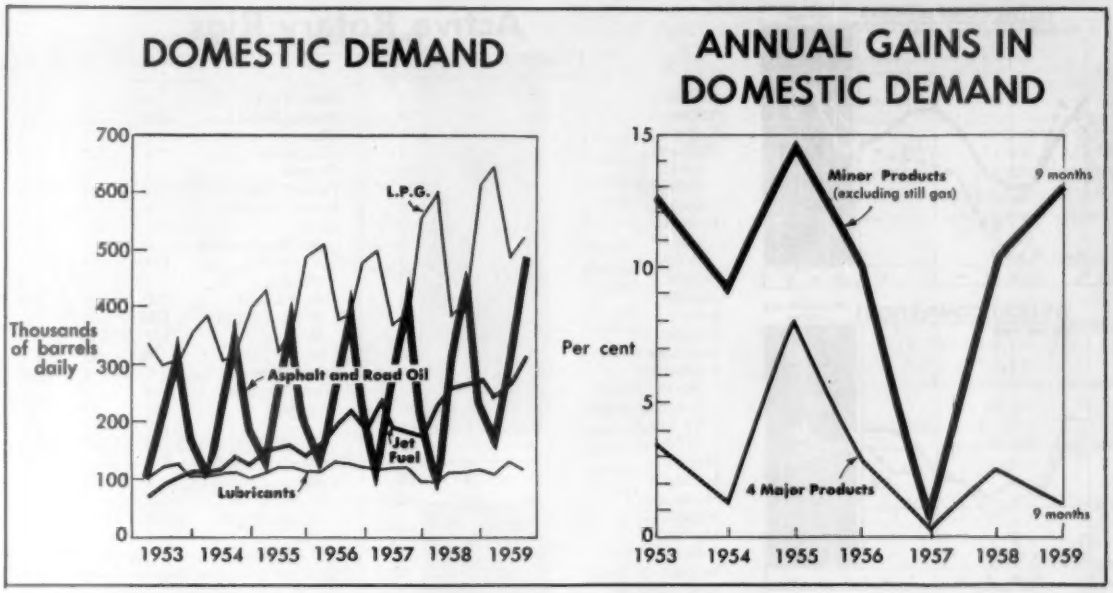
J. Warren MacClatchie, 66, owner of MacClatchie Manufacturing Co., Compton, Calif., died recently in an Escondido, Calif., hospital.

Guy Victor Mounsey, 73, Sperry, Okla., independent operator, died December 11 in a Tulsa hospital.

John E. Kilgore, 67, attorney and secretary of the import committee of National Petroleum Council and pioneer in proration laws, died December 13 in a Dallas hospital. Kilgore was a member of the Texas Conservation Committee which wrote the state's proration law during the 1930's. He was also a member of the industry committee which helped write the Connally Hot Oil Act. He was chairman of the mineral section of the State Bar of Texas and chairman of Oil and Gas Institute of Southwestern Legal Foundation.

Thomas Aquinas Murphy, 69, retired general manager of the fuel oil specialty plant at Humble Oil & Refining Co.'s Baytown, Tex., refinery, died December 12 at his home in Houston. Murphy retired in 1955 after 35 years with Humble.

William G. Corey, 67, mechanical engineer with Lacy Oil Tool Co., Los Angeles, died December 2.



Minor products crowd the limelight

BY JOHN C. CASPER

MINOR petroleum products are becoming more important every year. Demand for these products is growing faster than demand for major products. They account for a much larger percentage of total demand than they did a few years back. Most of them bring higher prices than the major products.

The minor petroleum products group includes all items other than gasoline, kerosine, distillate, and residual. Domestic demand for major products will average about 7,763,000 bbl. daily this year compared with 6,330,000 bbl. daily back in 1952. This represents a 7-year gain of 22.6% or an average annual increase of 2.96%.

Demand for minor products will average about 1,453,000 bbl. daily this year compared with 735,100 bbl. daily in 1952. The 7-year gain is 97.6% or an average of a little better than 10% a year. This total does not include still gas which was equivalent to 357,000 bbl. daily of crude for the first 9 months of this year. Still gas has been excluded from the minor-product total since most of this fuel is used at the refinery.

The chart on the left shows domestic demand for a few of the minor products. Jet fuel, LPG, asphalt, and road oil account for about 80% of demand in the minor group this year.

LPG and asphalt-road oil have sharp seasonal shifts in demand but the peaks come in opposite seasons. Since the demand for asphalt and road oil drops more in the winter than LPG gains, there is a slight loss in total minor-product demand during the winter months.

Jet fuel has had the highest percentage growth rate of all petroleum products in recent years. Demand was 55,000 bbl. daily in 1952 and is expected to average 288,000 bbl. daily this year. The 1959 total will represent a gain of 424% over 1952. The volumetric gain for the period is 233,000 bbl daily, for an average annual increase of 26.7%.

The importance of jet-fuel growth is the fact that it represents a shift of a portion of aviation demand from the high-octane-gasoline group to the naphtha-middle distillate range.

Demand for LPG has increased 92% in the past 7 years. Asphalt-road oil demand gained 43% for the same period and has prospects for good gains in the future.

Demand for coke is up almost 100,000 bbl. daily but about 44% of current production is catalyst coke which is burned at the refinery.

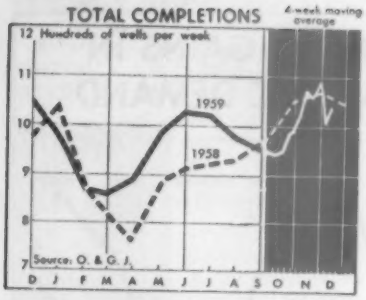
Lubricant sales are showing a good gain this year, but the total will be only about 15,000 bbl. daily more than for 1952. Wax is a low-volume product, but its percentage gain for the 7-year period was greater than percentage growth by gasoline.

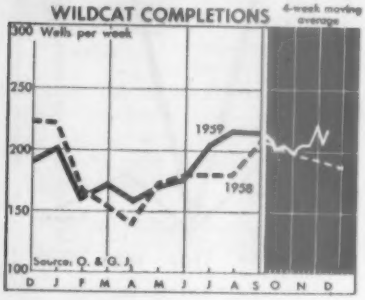
The right chart shows gains for both major and minor products.

A quick look at the highlights

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,143,500	UP	76,090	UP	31,425
Crude stocks	252,613,000	DOWN	52,000	DOWN	4,415,000
Completions	1,285	UP	527	UP	58
Refinery runs	7,975,000	DOWN	8,000	UP	187,000
Gasoline stocks	181,250,000	DOWN	156,000	UP	6,544,000
Kerosine stocks	29,013,000	DOWN	1,338,000	DOWN	634,000
Distillate stocks	160,487,000	DOWN	3,606,000	UP	12,400,000
Residual stocks	53,882,000	DOWN	16,000	DOWN	8,934,000
Four-product stocks	424,632,000	DOWN	5,116,000	UP	9,376,000
Total imports	1,738,300	DOWN	102,200	UP	128,800

DRILLING





Active Rotary Rigs

	12-14-59	12-7-59	12-15-58
Alabama	5	6	13
Arkansas	18	14	24
Arizona	0	0	1
California	97	90	98
Land	90	84	(*)
Offshore	7	6	(*)
Colorado	36	43	38
Florida	2	2	0
Land	2	2	0
Offshore	0	0	0
Illinois	47	42	50
Indiana	5	9	8
Iowa	0	0	3
Kansas	153	165	174
Kentucky	7	8	8
Louisiana	320	315	335
North	39	45	40
S. Inland waters	112	114	140
S. Land	115	99	113
Offshore	54	57	42
Maryland	0	0	1
Michigan	35	29	13
Mississippi	79	81	66
Missouri	1	1	1
Montana	25	23	27
Nebraska	29	28	22
Nevada	0	0	0
New Mexico	132	128	103
New York	0	0	1
North Dakota	28	24	30
Ohio	0	2	3
Oklahoma	255	247	272
Oregon	0	0	0
Pennsylvania	12	14	9
South Dakota	4	6	0
Texas	775	782	901
S. Inland waters	6	3	6
S. Land	198	193	210
Offshore	0	3	2
North-East	200	206	179
West Central	236	243	331
West	135	134	173
Utah	30	31	38
Washington	1	1	0
West Virginia	4	4	1
Wyoming	81	72	81
Total U. S.	**2,181**	2,167	2,321
Western Canada	213	198	193
Eastern Canada	1	1	1
Grand Total	2,395	2,366	2,515

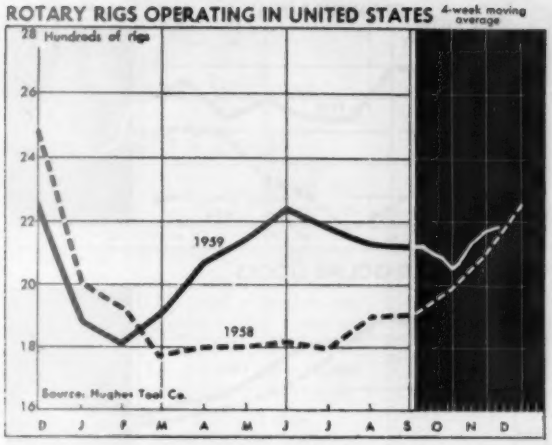
Hughes Tool Co. report. *Comparisons not available due to change in method of reporting.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 12, 1959

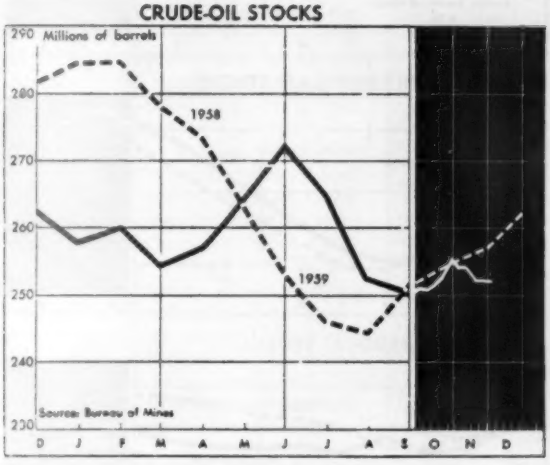
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	2	1	0	0	1	0	15,505	87	72	1	0	0	0	1	23	27
Arizona	1	0	0	0	1	0	464	26	.....	1	0	0	0	1	24	.....
Arkansas	31	20	0	1	9	1	104,429	811	789	2	0	0	0	2	143	155
California	27	14	0	3	10	0	125,011	1,460	1,434	6	0	0	1	5	387	352
Colorado	21	6	0	2	13	0	120,256	743	806	11	0	0	0	11	420	465
Illinois	54	24	0	0	30	0	114,120	2,247	2,321	12	1	0	0	11	377	431
Indiana	16	6	0	0	10	0	20,915	818	837	5	0	0	0	5	278	299
Kansas	66	16	1	7	41	1	241,875	3,773	3,842	25	0	0	1	24	1,012	807
Kentucky	127	108	0	0	16	3	83,506	3,056	1,933	8	1	0	0	7	354	171
Louisiana	83	44	7	5	27	0	558,874	3,599	3,347	8	1	0	0	7	480	490
North	38	22	0	2	14	0	128,565	1,434	1,317	5	1	0	0	4	220	220
South	32	16	3	3	10	0	296,503	1,771	1,630	3	0	0	0	3	245	246
Offshore	13	6	4	0	3	0	133,806	394	400	0	0	0	0	0	15	24
Michigan	16	8	0	1	7	0	57,956	625	412	6	0	0	1	5	178	137
Mississippi	11	6	0	0	5	0	115,753	606	385	3	0	0	0	3	266	167
Montana	4	3	0	0	1	0	26,018	323	315	0	0	0	0	0	115	126
Nebraska	24	6	0	0	18	0	139,958	860	699	17	1	0	0	16	380	334
New Mexico	51	23	3	5	20	0	219,916	2,000	1,853	12	1	0	0	11	242	257
West	18	7	2	5	4	0	66,388	881	907	3	0	0	0	3	63	96
East	33	16	1	0	16	0	153,528	1,119	946	9	1	0	0	8	179	161
New York	23	10	0	0	5	8	39,395	279	503	3	0	0	0	3	22	44
North Dakota	2	2	0	0	0	0	7,284	412	434	0	0	0	0	0	77	131
Ohio	25	9	0	6	8	2	63,072	1,038	1,008	0	0	0	0	0	31	18
Oklahoma	82	40	2	8	31	1	301,489	5,172	6,042	8	1	1	0	6	787	818
Pennsylvania	58	15	0	28	5	10	175,759	581	573	2	0	0	0	2	21	21
South Dakota	0	0	0	0	0	0	0	20	.....	0	0	0	0	0	9	.....
Texas	524	267	12	13	215	17	2,079,993	17,643	17,196	120	9	1	2	108	3,357	3,443
Dist. 1	19	6	1	4	8	0	61,759	1,027	956	4	0	0	0	4	313	357
Dist. 2	18	3	3	2	10	0	102,279	771	699	5	0	0	0	5	224	185
Dist. 3	21	8	2	0	11	0	146,877	1,122	1,223	4	0	0	0	4	222	271
Dist. 4	27	11	2	1	12	1	142,848	1,274	1,086	11	1	1	0	9	322	325
East	18	6	3	0	9	0	99,278	1,187	1,156	4	0	0	0	4	234	314
Dist. 7-B	*109	46	0	3	57	3	318,834	2,491	2,438	35	3	0	2	30	664	657
West	*135	98	0	1	36	0	643,069	5,240	4,907	24	2	0	0	22	716	664
Dist. 9	*142	69	0	0	60	13	374,926	3,327	3,464	26	2	0	0	24	555	552
Dist. 10	*35	20	1	2	12	0	190,123	1,204	1,267	7	1	0	0	6	107	118
Utah	2	0	0	0	2	0	11,954	290	369	0	0	0	0	0	88	78
West Virginia	15	1	0	14	0	0	42,477	750	744	1	0	0	1	0	28	21
Wyoming	20	7	0	2	11	0	115,192	921	728	11	1	0	1	9	339	249
Miscellaneous	0	0	0	0	0	0	0	90	91	0	0	0	0	0	57	81
Total U. S.	**1,285**	636	25	95	486	43	4,781,171	48,230	46,733	**262**	16	2	7	237	9,495	9,122
Previous week	758	371	21	61	265	40	3,289,168	.....	.....	161	17	1	3	140	.....	.....
Cum. 1959	48,230	24,066	1,175	3,560	18,075	1,354	198,206,432	.....	.....	9,495	838	103	311	8,243	.....	.....
Cum. 1958	46,733	23,106	1,059	3,509	17,761	1,298	188,403,664	.....	.....	9,122	879	144	254	7,845	.....	.....
Western Canada	54	29	0	9	14	2	283,397	2,298	2,346	18	4	0	5	9	636	617

*Incl. week ended Nov. 28.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	12-5-59	11-28-59	12-6-58
Pennsylvania	2,423	2,511	2,761
Other Appalachian	2,141	2,097	1,536
Illinois, Indiana, Michigan	10,217	10,010	10,684
Nebraska and North Dakota	3,052	3,096	2,348
Kansas	9,436	9,626	10,397
Oklahoma	15,849	14,822	17,102
Arkansas	2,163	2,028	2,426
Louisiana	18,487	18,560	16,939
North	3,398	3,233	2,994
South	15,089	15,327	13,945
Mississippi, Alabama, Florida	2,240	2,181	2,423
New Mexico	8,322	8,120	8,408
Texas	109,908	111,526	112,520
East Texas	7,816	8,136	8,356
West Texas	51,606	52,485	54,288
Texas Gulf	19,919	20,014	20,860
Other Texas	30,567	30,891	29,016
Wyoming	17,044	17,040	13,523
Other Rocky Mountain	9,375	8,916	9,175
California	28,546	28,942	33,158
Foreign	†13,410	13,190	13,628
Total	**252,613**	252,665	257,028

*Bureau of Mines. †Includes 4,587,000 bbl. in California.

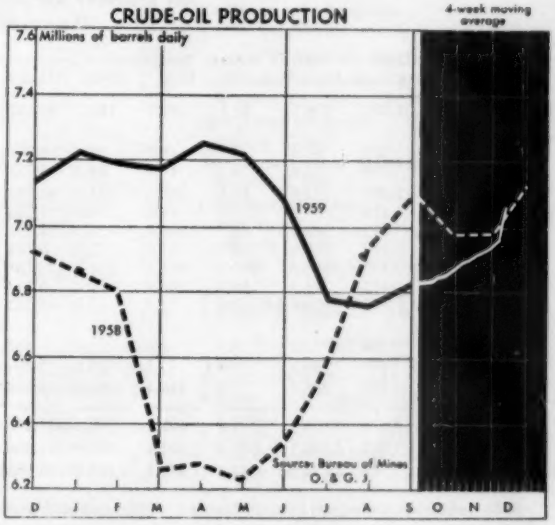
DAILY AVERAGE PRODUCTION FOR WEEK

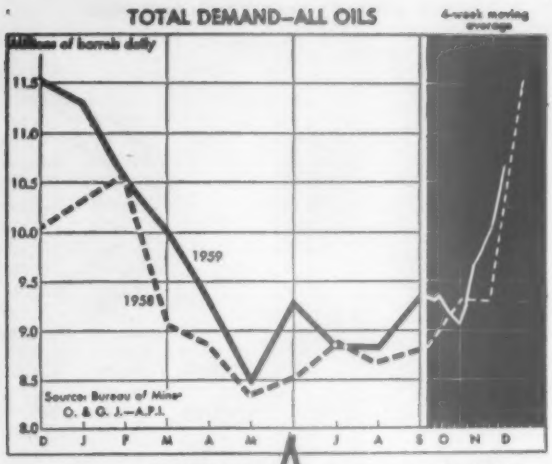
	December 12, 1959 — Crude oil	Lease condensate	Total	Dec. 5 total
Alabama	15,750	.....	15,750	16,000
Arkansas	84,000	300	84,300	82,770
California	837,800	.....	837,800	836,800
Colorado	126,600	.....	126,600	128,000
Eastern	39,800	.....	39,800	42,000
Florida	1,170	.....	1,170	1,170
Illinois	216,700	.....	216,700	215,800
Indiana	31,800	.....	31,800	31,500
Kansas	†333,000	.....	†333,000	†322,040
Kentucky	75,000	.....	75,000	78,600
Louisiana	929,250	117,850	1,047,100	1,033,620
North	108,250	5,850	114,100	114,000
South	821,000	112,000	933,000	919,620
Michigan	34,300	.....	34,300	33,400
Mississippi	140,920	5,050	145,970	145,750
Montana	80,300	.....	80,300	82,000
Nebraska	63,600	.....	63,600	63,800
Nevada	100	.....	100	100
New Mexico	289,600	6,500	296,100	295,680
North Dakota	50,100	.....	50,100	52,300
Oklahoma	†560,500	.....	†560,500	†548,600
Texas	2,566,000	81,200	2,647,200	2,594,470
Dist. 1	43,000	3,000	46,000	46,000
Dist. 2	110,000	8,800	118,800	116,230
Dist. 3	334,000	38,000	372,000	365,120
Dist. 4	180,000	9,800	189,800	185,950
Dist. 5	26,000	400	26,400	25,980
Dist. 6	107,000	9,500	116,500	114,350
East Texas field	141,000	.....	141,000	137,570
Dist. 7-B	128,000	180	128,180	127,330
Dist. 7-C	125,000	3,320	128,320	125,320
Dist. 8	1,059,000	5,000	1,064,000	1,037,000
Dist. 9	205,000	2,200	207,200	205,470
Dist. 10	108,000	1,000	109,000	108,150
Utah	112,500	.....	112,500	120,600
Wyoming	343,400	.....	343,400	342,000
Others	‡410	.....	‡410	‡410
Total U. S.	6,932,600	210,900	**7,143,500**	7,067,410
Change from prev. week, up			**76,090**	
Canada	†501,900	.....	†501,900	†494,000

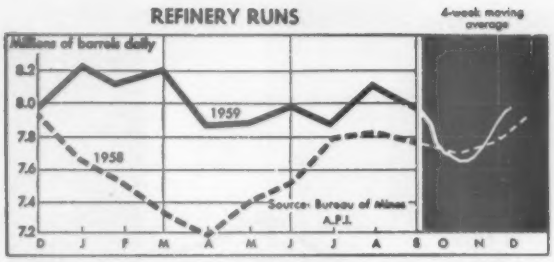
Total U. S. prod., Jan. 1-Dec. 12 ..... 2,434,092,560 bbl.
Same period last year (crude plus cond.) .... *2,313,135,640 bbl.

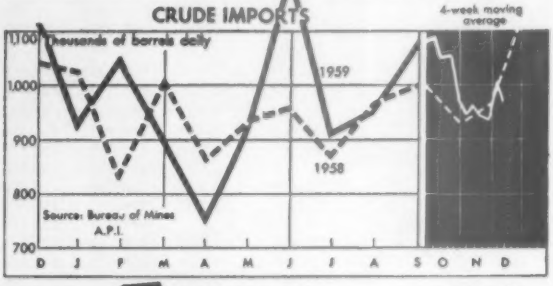
*Includes 55,147,500 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington.

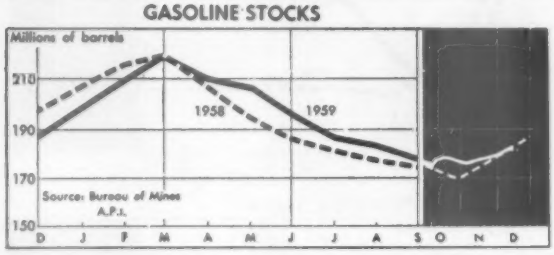
CRUDE-OIL PRODUCTION

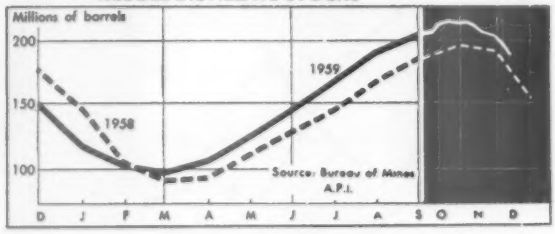


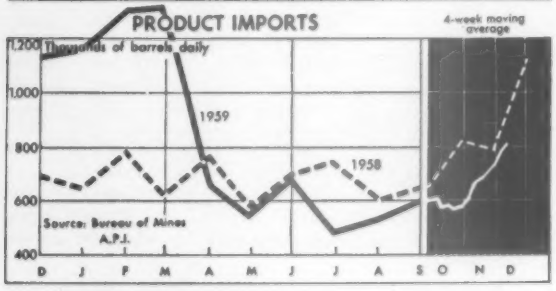


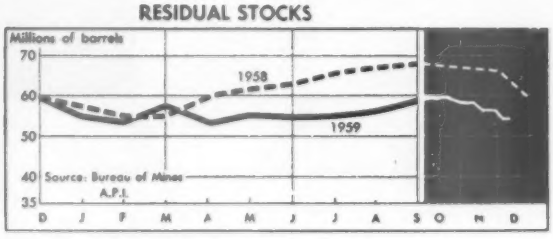












API REFINERY REPORT—DECEMBER 11, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1958: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,083	538.7	43.3	389.6	163.7	40,132	13,064	64,013	11,218	1,149	575.7	36.4	383.1	213.1
Appalachian:														
District 1	105	44.7	7.3	16.7	14.4	6,004	711	4,394	369	102	42.6	5.8	20.3	12.1
District 2	108	55.6	8.7	17.9	19.1	2,753	536	1,795	417	102	51.5	5.0	21.1	16.1
Ind., Ill., Ky.	1,469	772.0	59.4	362.0	221.4	30,294	6,107	24,579	5,372	1,450	738.1	70.7	335.8	205.7
Minn., Wis., Dak.	121	59.1	13.7	19.0	18.9	7,226	1,291	6,709	681	109	53.8	5.5	29.5	14.0
Okla., Kans., Mo.	690	369.8	12.7	196.4	25.3	18,052	1,314	11,143	1,091	761	427.8	17.7	203.7	37.7
Inland Texas	279	218.4	4.4	57.4	22.0	6,763	485	1,910	2,345	286	216.2	7.5	46.1	25.2
Texas Gulf Coast	1,852	943.0	115.9	454.3	141.2	22,264	2,719	19,957	5,611	1,864	960.1	128.4	506.8	184.3
La. Gulf Coast	712	336.9	56.7	168.9	39.4	9,944	1,213	7,292	1,045	665	372.8	82.9	139.3	57.2
N. La. and Ark.	107	36.6	3.9	22.7	7.0	5,302	908	2,319	192	95	48.3	4.8	22.6	6.0
Rocky Mountain:														
New Mexico	18	12.3	0.3	3.6	1.3	865	27	233	50	25	12.8	0.7	4.2	2.4
Other R'cky Mt.	309	143.9	5.4	71.1	33.0	5,267	231	2,374	1,157	268	130.1	3.0	64.8	35.0
West Coast	1,122	505.3	5.7	169.4	285.4	26,384	407	13,769	24,334	1,085	515.8	5.6	177.4	295.9
Dec. 11, 1959	7,975	4,036.3	337.4	1,949.0	992.1	181,250	29,013	160,487	53,882	7,961	4,145.6	374.0	1,954.7	1,104.7
Dec. 4, 1959	7,983	4,110.3	371.4	1,881.1	959.0	181,406	30,351	164,093	53,898	.....	.....	.....	.....	.....
Dec. 12, 1958	7,788	4,034.3	385.4	1,950.1	1,001.6	174,706	29,647	148,087	62,816	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Kerosine—No. 2 price spread widens on the Gulf Coast

KEROSINE PRICES are up on the Gulf Coast. Quotations for cargo lots of No. 2 fuel also increased, but not as much as the boost given kerosine. Some Gulf Coast refiners raised the No. 2 price 0.25 cent a gallon on December 9. Quotations for kerosine moved up 0.375 cent at the same time. On December 15, a refiner raised kerosine 0.25 cent which was promptly met by other refiners in the area.

This means that current kerosine price is 0.875 cent higher than the price for No. 2 fuel. This is in line with recent predictions of a coming increase in the spread between these product prices. (OGJ, Nov. 23, p. 154, and Dec. 14, p. 148).

In the period just after World War II, demand for kerosine and No. 1 fuel on the upper part of the East Coast was strong enough to maintain a 1-cent differential between kerosine and No. 2 fuel. A gradual drop in the demand for kerosine has tended to reduce this differential in recent years. For the last 5 months of 1957, kerosine and No. 2 fuel were quoted at the same price. The spread was only 0.375 cents for the July-September period this year.

Jet-Fuel Sales Good

The improved kerosine price is related to increased demand. Sales of jet fuel have been good and even JP-4 requires a good percentage of kerosine or light distillate in the blend. Shortage of No. 1 in the Group 3 area had boosted upriver movement of kerosine and No. 1 fuel from the Gulf Coast.

Increased use of kerosine for tobacco curing in the southeastern states added to the kerosine demand this fall. Also, the recent cold weather in Florida helped sales of kerosine in that area.

Formal postings for gasoline on the Gulf Coast dropped 0.25 cent a gallon earlier in the month, but the cut only reflected underposting sales that had been general for several months. Regular gasoline is now freely available at 0.25 cent off posting, and premium can be found for 0.375 cent off.

Low-sulfur residual is scarce on the Gulf Coast, but there is little chance of price increase for Bunker C. Plenty of heavy fuel will be available under new import quotas at the first of the year.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill§ Calif.	Okla-homa	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 9-12-59.

§Union Oil Co. of California posting up to 25 cents less per barrel.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.95
West Virginia	3.77
Buckeye Grade	3.62
Illinois Basin	**3.00**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.80
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	10.25
★ Premium (99 octane)	13.00
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.25-10.50
★ Regular (92 octane)	10.50-10.75
★ Premium (98 octane)	11.75-12.00
California (rack) Los Angeles):	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
★ Regular (87 octane)	10.125
★ Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.25
Diesel oil (58 d.i. and above)	10.00
Distillate No. 1	10.00
Distillate No. 2	9.25
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.25
Distillate No. 2	8.375
New York Harbor (barges):	
Kerosine 41-43	10.10
Distillate No. 2	9.60
Diesel fuel, 48-52 d.i.	9.90
Caribbean area (cargoes):	
★ Distillate No. 2	8.375

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$1.80-1.90
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-USNH, clean (ATRS+15%)	$3.28
★ Gulf-USNH, dirty (ATRS flat)	2.85
★ Carib.-USNH, dirty (ATRS −42.5%)	1.58
★ Sidon-USNH, dirty (USMC−60%)	3.12
P.G.-UK, dirty (Scale−45%) (32s. 7d.)	4.56

★ Denotes change from previous week.

Discovery wells

(Continued from page 120)

BOPD, 6/64-in., 39.3°, GOR 632 cu. ft. per bbl., TP 850 psi., perf. 7,027-32 ft., Vicksburg. TD 8,081 ft. New pay in North Sun field.

Sun Oil Co. 2 Kincaid, Section 269, City of San Antonio Sur. AOF 3,800 M.c.f.d., GLR 58.73 M.c.f. per bbl., 57.5°, shut-in TP 2,674 psi., perf. 6,803-12 ft., Vicksburg. TD 7,503 ft. New pay in North Rincon field.

WEST TEXAS

Andrews County: Ralph Lowe 1 Superior-University, Sec. 27, Blk. 11, University Lands Sur., 12 miles northwest of Goldsmith, new pay in Blk. 11 (Wolfcamp) field. IP 80 BOPD, ¾-in. choke, 44°, GOR 1200:1, TP 200 psi., Fusselman 8,203-25 ft. TD 8,241 ft.

Coke County: Dothan Drilling Co. 1 R. E. Cumbie, Sec. 324, Michael Fox Sur., 3 miles southeast of Bronte, IPP 29 BOPD, 43°, Palo Pinto limestone 4,267-71 ft. TD 5,316 ft.

Ector County: Texas Gulf Producing Co. 1 Barrow, Sec. 27, Blk. 42, T1S, T&P Sur., 3 miles north of Odessa. IP 89 BOPD, ¼-in. choke, 48°, GOR 1713:1, TP 400 psi., Devonian 12,224-12,300 ft. TD 12,437 ft.

Ward County: Texaco Inc. 1-DC State, Sec. 3, Blk. 18, University Lands Sur., 6 miles northwest of Pyote. IP 15,060 M.c.f. of gas, Delaware 4,972-96 ft. TD 8,490 ft.

UTAH

Uintah County: Belco Petroleum Co. 5 Chapita Wells, SW NE 22-9s-22e. IPF 3,400 M.c.f.d. Wasatch Discovery, new field. TD 10,147 ft.

WESTERN CANADA

Alberta: British American-Pan Cora 2-1-66-11 Swan Hills, LSD 2, 1-66-1w5. Beaverhill Lake oil discovery. TD 8,864 ft.

Kewanee 4-7-69-10 Inverness, LSD 4, 7-69-10w5. Beaverhill Lake oil discovery. TD 7,966 ft.

Cree-Cego 6-2-30-3 Carstairs, LSD 6, 2-30-3w5. Cardium oil discovery. TD 8,632 ft.

Mic Mac et al. 16-11-50-8 North Pembina, LSD 16, 11-50-8w5. Cardium oil discovery. TD 4,734 ft.

Northern Natural-CPOG 11-7-27-18 1A East Co., LSD 11, 7-27-18w4. Gas discovery. TD 4,470 ft.

Pan American 1-20-51-12 B-1 Birch Lake, LSD 1, 20-51-12w4. Blairmore gas discovery. TD 2,595 ft.

Cal-Standard 4-20-41-2 North Gilby, LSD 4, 20-41-2w5. Pekisko gas discovery. TD 8,243 ft.

Pan Am. et al. 14-26-50-8 E-1 Lob, LSD 14, 26-50-8w5. Mississippian gas discovery. TD 6,394 ft.

Shell 12-26-62-26 Simonette, LSD 12, 26-62-26w5. D1 gas discovery. TD 11,965 ft.

MICHIGAN

Jackson County: Bell & Gault Drilling Co. 1 Bissell, SE SW NE 8-4s-2w, Hanover Township. 7 miles east Pulaski field. 17 M.M.c.f.d. gas. Elev. 1,034, Trenton 3,825, dolomite 3,970, gas pay 4,009. TD 4,454 ft. New gas pool.

TEXAS GULF COAST

Chambers County: J. P. Petkas et al. 1 Casey-Barrow Unit, Solomon Barrow Sur., A-3, 5 miles southeast of Mount Belview. AOF 56 M.M.c.f.d., GLR 46 M.c.f. per bbl., 58.5°, shut-in TP 2,691 psi., perf. 7,658-61 ft., Frio. TD 8,319 ft. New reservoir discovery ¾ mile southeast of South Cotton Lake field.

DeWitt County: Harkins-Musselman 1 Nick Bomba, James Duff Sur., A-153, 5 miles west of Meyersville, AOF 4,600 M.c.f.d., dry gas, shut-in TP 1-262 psi., perf. 3,094-3,100 ft., Frio. TD 7,815 ft. New-pay discovery in West Cottonwood Creek area.

Goliad County: Welsh Oil & Gas Co. 1 Hall, David N. White Sur., A-291, 2 miles north of Goliad. AOF 152 M.M.c.f.d., dry gas, shut-in TP 1,264 psi., perf. 2,948-52 ft., Frio. TD 3,150 ft. Extension and new-pay discovery in Wilhelm area.

Blair-Vreeland 1 Gayle, I. Guajardo Sur., A-127, 8 miles northeast of Berclair. AOF 3,200 M.c.f.d., dry gas, shut-in TP 1,442 psi., perf. 3,650-54 ft., Frio, and 15,900 M.c.f.d., dry gas, 1,340 psi., perf. 3,158-62 ft., Frio. TD 4,015 ft. New-field discovery.

Whitehall Oil Co. 1 Ralph Ramsey, Maria de Jesus Y'Barvo Grant, A-51, 8 miles northwest of Goliad. AOF 15 M.M.c.f.d., dry gas, shut-in TP 984 psi., perf. 2,446-57 ft., Frio. TD 9,015 ft. New-field discovery.

Hardin County: Sinclair Oil & Gas Co., et al. 5 J. A. Vickers fee, John A. Vickers Sur., A-52, 2 miles northwest of Silsbee. IP 242.06 BOPD, 8/64-in., 37.5°, TP 3,950 psi., GOR 3-619 cu. ft. per bbl., perf. 10,296-306 ft., Wilcox, and 142.68 BOPD, 10/74-in., 50.8°, TP 2,450 psi., GOR 4,063 cu. ft. per bbl., perf. 9,774-81 ft., Wilcox. TD 11,200 ft. Extension and new-pay discovery in Vickers field.

Harris County: Humble Oil & Refining Co. 1 Olcott Gas Unit 1, W. K. Smith Sur., A-735, 2¾ miles south of Genoa. AOF 63 M.M.c.f.d., GLR 1 M.M.c.f. per bbl., 39.4°, shut-in TP 1,795 psi., perf. 4,451-57 ft. and 4,461-76 ft., Miocene. TD 4,550 ft. New pay in Olcott field.

Oil and Gas Corp. of America 2 Rudolph Weiss, P. J. Duncan Sur., A-232, 3 miles west of Highlands, IP 3,900 M.c.f.d., 50 BC per M.M.c.f., 12/64-in., 62.2°, TP 3,500 psi., shut-in TP 6,420 psi., perf. 10,620-26 ft. TD 10,660 ft. New-field discovery.

Jackson County: Gus Glasscock, Inc., 1 Daisy Flournoy Unit, Jose San Pierre Sur., A-69, 2 miles northeast of Morales. AOF 14,500 M.c.f.d., dry gas, shut-in TP 1,339 psi., perf. 3,468-74 ft., Frio. TD 4,656 ft. New field.

H. H. Howell et al. 1 Fern Lorenzen, Section 5, W. C. Hahl Subd. of Harwood Burns Ranches, John J. Linn Sur., A-213, 5 miles south of Edna. IP 31 BOPD, 3/16-in., 41.4°, GOR 480 cu. ft. per bbl., TP 50 psi., perf. 6,594-96 ft., Frio. TD 6,591 ft. New pay in South El Toro field.

Edwin L. Cox, Turnbull & Zoch, and Union Oil Co. of California, 3 Menefee, Elizabeth McNutt Sur., A-46, 6 miles south of Edna. AOF 26,500 M.c.f.d., GLR 22,190 cu. ft. per bbl., 67.3°, shut-in TP 2,427 psi., perf. 7,048½-52½ ft., Frio. TD 7,300 ft. New pay in North Texana field.

Edwin L. Cox, Turnbull & Zoch, and Union Oil Co. of California 2 Menefee. Lot 1, Rainey-Robinson Subd., H. M. Munson Sur., 6 miles south of Edna. IP 310 BOPD, 3/16-in., 39.4°, GOR 2,340 cu. ft. per bbl., TP 1,720 psi., perf. 6,302-08 ft., Frio., and AOF 26,500 M.c.f.d., GLR 476 M.c.f. per barrel, 58.1°, shut-in pressure 1,646 psi., perf. 5,852-54 ft., Frio. TD 7,500 ft. New pays in North Texana field.

Killam & Hurd 1 Robert J. Wearden, James Williams Sur., A-267, 12 miles northeast of Edna. AOF 25,500 M.c.f.d., dry gas, shut-in TP 1,155 psi., perf. 2,694-2,706 ft., Catahoula. TD 3,252 ft. New field.

K & H Operating Co. 1 States Realty & Investment Co., Ramon Musquiz Grant, A-59, ½ mile northwest of Vanderbilt. AOF 44 M.M.c.f.d., GLR 5,924 M.c.f. per bbl., 54°, shut-in TP 2,431 psi., perf. 6,174-82 ft., Frio. TD 7,570 ft. New field.

W. L. Pickins 5 Hawes, Lot 24, Fosters Replat of Pickering Ranch, Jesse White Sur., A-82, 5 miles north of Lolita. IP 139 BOPD, 12/64-in., 32°, GOR 1,260 cu. ft. per bbl., TP 3,450 psi., perf. 5,816-20 ft., Frio. TD 6,750 ft. New pay in North Laward field.

Texkan Oil Co. 1 Cora Robertson, Lot 22, Pickering Ranch Subd., Partick Scott Sur., A-69, 6 miles north of Lolita. IP 164 BOPD, 8/64-in., 37.2°, GOR 1,140 cu. ft. per bbl., TP 1,015 psi., perf. 6,922-26 ft., Frio. TD 7,219 ft. New pay in North Laward field.

Jefferson County: Meredith & Co.-Michel T. Halbouty 2 Grinnell Texas Co., N. Grisby Sur., A-125, 6 miles northeast of Port Arthur. AOF 2,900 M.c.f.d., GLR 12,490 cu. ft. per bbl., 49.2°, shut-in TP 6,895 psi., perf. 10,721-26 ft., Vicksburg. TD 11,023 ft. Discovery well of Grinnell field.

Standard Oil Co. of Texas 1 Federal 52, Block 52, Tract 108-L, High Island Area, Gulf of Mexico. IP 228 BOPD, 10/64-in., 37°, perf. 8,520-26 ft., Miocene. TD 9,928 ft. New offshore field.

Liberty County: Humble Oil & Refining Co. 1 Bishop, F. J. C. Smiley Sur., A-345, 8 miles northeast of Cleveland. AOF 10 M.M.c.f.d., GLR 14.8 M.c.f. per bbl., 55.7°, shut-in TP 2,950 psi., perf. 9,214-26 ft. and 9,242-54 ft. TD 9,500 ft. New field.

Live Oak County: Rhodes & Hicks Drilling Corp. and C. C. Winn 1-A C. N. Freeman et al., P. Salinas Sur., A-419, 4 miles northwest of Dinero. IP 99 BOPD, ⅛-in., 40°, GOR 486 cu. ft. per bbl., TP 540 psi., perf. 3,955-62 ft., Hockley. TD 4,116 ft. New field.

Sutton Drilling Co. 1 Sahm Unit, Lot 31, Dilworth Ranch Subd., Juan Carrol Sur., A-4, 4 miles east of George West. IP 80 BOPD, 12/64-in., 32.5°, GOR 740 cu. ft. per bbl., TP 250 psi., perf. 8,521-29 ft., Wilcox. TD 8,572 ft. New pay in East George West field.

WEST CENTRAL TEXAS

Brown County: Lee Ratner 1 Grelle & Kirkpatrick, D. Wofford Sur. 152, 2½ miles northeast of Brooksmith. IP 3,650 M.c.f. of gas, Marble Falls limestone 1,140 ft. TD 1,192 ft.

Coleman County: Daya Operating Co. 1 Sealy & Smith, Sec. 31, GH&H Sur., 3 miles northwest of Valera. IPP 56 BOPD, 47°, GOR 350:1, Gardner sand 3,352 ft. TD 3,358 ft.

Palo Pinto County: Pan American Petroleum Corp. 1 Cedar Springs Methodist Church, Sec. 29, Blk. 3, T&P Sur., ½ mile west of Brad. IP 880 M.c.f. of gas, with trace of condensate, 20/64-in choke, TP 325 psi., conglomerate 3,980-88 ft. TD 4,255 ft.

Stephens County: Cunningham & Shahan 1 Frasier, Sec. 121, HT&B Sur., 10 miles north of Eastland. IP 17½ BOPD, 12/64-in. choke, 38°, GOR 580:1, TP 60 psi., pay 1,778-86 ft. TD 1,880 ft.

Cunningham & Shahan 1 Lillie Langford, Sec. 121, HT&B Sur., 10 miles north of Eastland. IPP 34½ BOPD, 38°, GOR 425:1, pay 2,030 ft. TD 2,048 ft.

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66"	70'	30	250
60"	76'	28	120
60"	33'	15	245
54"	39'	16	35
54"	32'	10	55
48"	34'	4	275
42"	61'	24	100
42"	22'	8	130
42"	30'	8	25
36"	58'	30	154
36"	47'	20	120

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10	Admiralty	200 to 636
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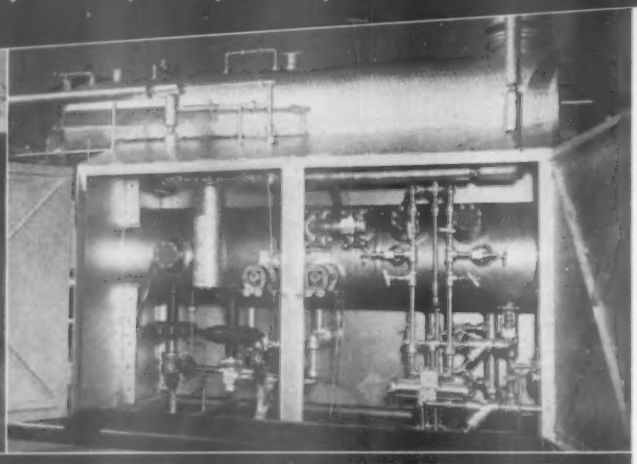

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Why "Seal·Grip" is your most dependable replaceable tool joint

DESIGN. All mating surfaces – outer seal, pipe threads and inner seal – are on the same taper, assuring uniformity of fit on initial and replacement installations. This feature permits make up to compensate for possible deformation when applying new joints on used pipe, or old joints on new pipe.

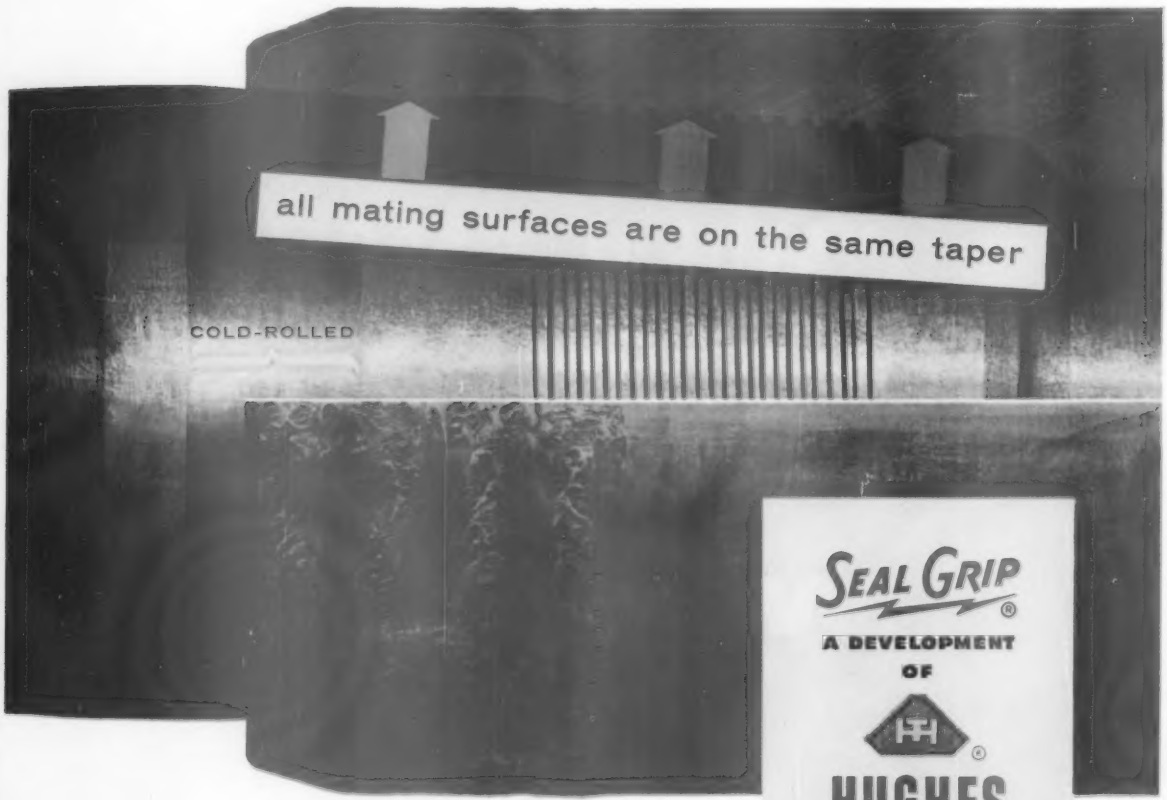
COLD-ROLLING. The large land of all "Seal-Grip" pipe is cold-rolled at the mills. This process so increases the fatigue resistance of the pipe that failures have been eliminated in this zone.

COPPER PLATING. To protect the threads and shoulders against galling during the critical break in period, all Hughes tool joints are copper plated. Years of service have proved copper plating to be the most effective anti-galling agent yet developed for tool joints.

HARDFACING. "Hughesite"—developed and manufactured by Hughes – assures long-lasting protection against tool joint wear. Interruption of the guide ribs with hardfacing provides a continuous wear-resistant surface that protects the guide ribs and adjoining tool joint metal against undercutting.

SNOW TESTING. In addition to processing controls to safeguard the quality of Hughes hardfacing, all Hughes hardfaced tool joints are "snow" tested – a new inspection method that is a positive check of the bonding of hardfacing to the parent metal of the tool joint.

40 YEARS EXPERIENCE. Starting with the first alloy heat treated tool joint, Hughes has put more joints on pipe than all other manufacturers combined.



"Seal-Grip" tool joints are also available for attachment on new API LIGHTWEIGHT drill pipe.

SEAL GRIP®
A DEVELOPMENT OF
HUGHES
TOOL COMPANY
HOUSTON, TEXAS